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THE JOURNAL

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(BOTANY.)

A Contribution to the Flora and Plant Formations of Mount Kinabalu and the Highlands of British North Borneo. By Lilian S. Gibbs, F.L.S.

(Plates **1–8**; and 8 Text-figures.)

[Read 5th June, 1913.]

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INTRODUCTION.

THE botanical exploration of British North Borneo has up to the present been strictly limited to the mountain of Kinabalu itself, the highest mountain of the Malay Archipelago, which was first ascended by a botanist, Sir Hugh Low, then Colonial Secretary of Labuan, who made the ascent in March, 1851.

Low, in a second ascent with Spencer St. John, in June, 1858; Burbidge in November, 1877, and August, 1878; Whitehead in February, 1888, and finally Haviland in May, 1892, all contributed to the knowledge of the mountain. Haviland collected for six weeks on and about Kinabalu, and the results of his work, and that of his predecessors, have been admirably summarised by Dr. Stapf in his invaluable "Contribution to the Flora of Kinabalu," Trans. Linn. Soc. ser. 2. Bot. iv. (1894), in which are enumerated about 360 species of plants collected on and about the mountain or on the route up from the coast.

Excellent botanical work, unfortunately as yet unpublished, has also been done on the coastal flora of the country. James Motley, Manager of the Labuan Coal Mines, made large collections in Labuan, from 1852 onwards *. Dr. Fraser, an officer of the B. N. Borneo Co., who was appointed at Kudat in 1883 and treacherously shot by Muruts at Kawang in the following year, collected round Marudu Bay, on Banguey or Panggi and Balambangan Islands, and at Gaya and Papar. His tragic fate is described by Whitehead (**16**. 27). Governor Creagh, who was appointed in 1888 and retired in

* On Motley's departure from Labuan for Dutch Borneo his collections were mostly bought by a Mr. Barber, who presented them to Kew. The latter's name, in consequence, generally figures on the Herbarium sheets and is often erroneously quoted as that of the collector. Settled near Banjermassing Motley again made large collections, but his work was brought to an untimely end, as he was murdered by Mahommedan settlers along with his wife and children in 1859. He collected in all about 1300 specimens which, supplemented by very valuable notes and letters, are preserved at Kew.

1895, collected extensively round the whole coast from Cowie Harbour to Gaya and Kimanis *.

These collections of Motley, Fraser, and Creagh give a very reliable idea of the coastal flora of British North Borneo, which otherwise was practically unknown with the exception of a few plants collected by Low, Haviland, and Burbidge on the way up to Kinabalu, and have proved most useful in the course of my work—practically limited to the interior—by forming a basis for a study of the relative distribution of plants throughout the country.

By working in British North Borneo and especially on Kinabalu itself, I hoped to be able to fill in some of the blanks in our knowledge of the phytogeography of this very interesting British territory.

I landed at Jesselton, the capital, at the end of December, 1909, when it was considered too early in the season to attempt the ascent of the mountain, not only on account of the rains, which were not yet over, but also because the Dusuns, who always act as porters, were busy with their padi harvest and would not have been available for that purpose.

Under these circumstances, and acting on the advice of the Governor, Mr. H. P. Gueritz, I decided to defer the ascent and work round from the interior, staying first at Tenom for the purposes of general collecting, and then proceeding via Kaningau, Tambunan, and Renagong to Kiau, at the base of the mountain.

In all about 1000 plants were collected, of which 87 have proved new to science, including 4 new genera; of these 337 specimens, comprising 3 new genera and 38 new species, are referable to Kinabalu itself, among them 129 new records as compared with Stapf's list of the Kinabalu plants.

For *Loranthus centiflorus*, hitherto considered as endemic on Kinabalu, a wider range of distribution has been proved. Previously collected at 6000′ on Kinabalu, it was now found at Tambunan at 2000′. On the other hand *Strobilanthes kinabaluensis*, known only from the Kadamain river at 2000′, was collected on the mountain at 6000′, and was also plentiful in recent jungle from Renagong to Bunda Tuhan.

A wider distribution has also been established for a number of secondary forest plants, viz., *Sphærothalamus insignis* and *Baphia borneensis* (Sarawak), *Saurauia ferox*, *Otophora imbricata* and *Marsilea quadrata* (Sarawak and Dutch Borneo), and *Adinobotrys Nieuwenhuisii* (Dutch Borneo); while *Dacrydium falciforme*, recorded from Sarawak, Dutch Borneo, and the Philippines, is general on the Kinabalu spurs. In fact the plants of the present collection, both from the primary and secondary forest, show a strong connection with

* It is gratifying to note that Mr. H. N. Ridley, in his "Contributions to the Flora of Borneo," in the Sarawak Museum Journal, will now be able to do justice to the work of these indefatigable and successful collectors.

Philippine types, running up through Palawan. *Ardisia Copelandii*, *Scævola pedunculata* var. *mollis*, *Polypodium pleiosoroides*, *Hymenophyllum fraternum*, *Schistocheila Wallisii*, and *Centrolepis philippinensis*, all from Kinabalu itself, with *Gardenia Merrillii*, *Symplocos oblongifolia*, and *Scleria purpureo-vaginata* from the secondary forest area, have previously only been described from the Philippines. Affinity is also shown to about an equal degree with the Malay Peninsula, Java, and Sumatra on the one hand, and to a lesser extent with Celebes and New Guinea on the other. Of these plants *Centrolepis philippinensis* proved the most interesting record, as this species is the northernmost representative of an Australian genus.

The phytogeographical relationships and systematic affinities of the plants enumerated in the "Flora of Kinabalu" have already been ably and exhaustively treated by Dr. Stapf.

In the map of British North Borneo at the end of this paper the outlines of the two provinces Dent and Keppel, to which this collection is limited, are given, as also the localities cited in the course of the present work together with those of previous collectors as far as this was possible. Thanks to the courtesy of Captain Learmonth, it has been possible to inset a tracing taken from an Admiralty Hydrographic Survey of the N.W. part of British North Borneo carried out by H.M.S. 'Merlin,' 1909–10, showing the immediate environment of Kinabalu.

It is a melancholy privilege to acknowledge the help and encouragement received from the late W. C. Cowie, Esq., one of the pioneers in the inauguration of the Chartered Company of British North Borneo, of which he was for many years Chairman and Managing Director. He was not only most interested in the purely botanical questions involved, but also practically assured the success of the Expedition by his recommendations, which afforded me many facilities when in the country.

I must also gratefully acknowledge the efficient and disinterested help received from all officials of the North Bornean Company with whom I was brought into contact, especially Messrs. A. C. Pearson, A. B. C. Francis, H. W. L. Bunbury, W. C. Weedon, and D. R. Maxwell. It is to that help, so generously given, that I can alone ascribe any results that may have been achieved.

My thanks are also due to His Excellency H. P. Gueritz for his great kindness and hospitality; to Captain Learmonth, R.N., commanding H.M.S. 'Merlin,' for the valuable sketch-maps of the summit of Kinabalu included in this paper; to Dr. Foxworthy, of the Manila Bureau of Science, for placing the excellent photographs taken by him on his ascent of the mountain at my disposal; to Mr. A. Barclay, Assistant Resident at Labuan; to His Highness the Rajah Muda at Sarawak, for facilitating a short stay on Matang near Kuching by lending me the bungalow "Vallombrosa";

finally to Mr. Resident Day, Mr. Groves, and to Dr. Barker, Chief Medical Officer at Kuching, for their kind hospitality.

In the systematic portion of this work, I must acknowledge my deep indebtedness to Dr. Otto Stapf, Keeper of the Royal Herbarium at Kew, for his kind collaboration, as also to Messrs. E. G. Baker, H. F. Wernham, Spencer le M. Moore, J. Hutchinson, R. A. Rolfe, A. Gepp, Miss A. Lorrain Smith, Mrs. E. S. Gepp, and the late H. Groves; then to Mr. W. West for the critical investigation of the freshwater algæ, and to Mr. H. N. Ridley for working out a great part of the Monocotyledons and also for the very useful loan of plant-presses from the Singapore Gardens, which were of the greatest service in the field. I also thank M. Casimir de Candolle, Professor J. Macfarlane, Dr. Odoardo Beccari, and Count Ugolino Martelli for working out the Piperaceæ, Nepenthaceæ, Palmaceæ, and Pandanaceæ respectively; Professor Radlkofer, for a critical determination of Sapindaceæ; and Dr. F. Cullis, of the Royal School of Mines, who was good enough to examine the couple of rock specimens obtained. Further, I acknowledge a grant of £30 from the Royal Society for the purposes of this research; and finally my thanks are due to Dr. A. B. Rendle, Keeper of the Department of Botany at the British Museum, for his invariable kindness and the invaluable facilities afforded to me at the British Museum in working out this collection.

I. GENERAL CHARACTER OF THE COUNTRY.

1. Orography.

The West Coast of North Borneo as seen from the sea, after leaving Labuan, is very beautiful in outline. Parallel lines of hills, 4000–5000′ in height, covered with luxuriant forest, send short spurs to the coast, which, clothed in vegetation to the water's edge, form innumerable bays of varying sizes, with level stretches of white sand fringed with *Casuarina* and broken by mangrove swamps, where rivers flow into the sea.

Seen from Gaya Island these sandstone hills are dominated to the N.W. by the magnificent granite mass of Kinabalu, which viewed from the west has the appearance of an isolated cone, as only the highest portion, viz. the southern buttress, is visible from this side, its many peaked pinnacles emerging from the mysterious shroud of clouds which generally veil its imposing outline. Of similar altitude and isolated conspicuousness, Kinabalu recalls the Peaks of Tenerife or Fuji, but in majestic outline and grandeur of position it surpasses those rivals, and well substantiates its name Kinabalu, which in the Bajow tongue—Kina bahu—means the "greatest of all."

Though situated at about 40 miles from the coast it is a familiar object as far south as Labuan, and commands not only the whole of the coast-line, but

also the interior of this highland country. The natives have invested it with a wealth of legendary lore that even Fuji can hardly rival! On its mist-crowned summit the souls of the departed find their eternal home, phantom herds of buffalo follow their masters to graze on the shadowy grasses which abound in that fabled kingdom. By those who would scale its sublime heights many ceremonies have to be performed to propitiate the "Hantu," or spirits of the mountain, and mollify their resentment at the intrusion of mortals on their sacred precincts.

Round these coasts the sea is very shallow. The rivers constantly bring down enormous masses of material, thus continually increasing the land areas at their mouths and driving the mangrove formation further into the sea.

Posewitz (**13.** 259) holds that "In the Tertiary Period the configuration of Borneo resembled an extensive archipelago, in which small island groups and larger islands were surrounded by the sea," and that since then the country has been gradually built up by the deposition of sedimentary material *in situ* surrounding the islands. He also mentions that it is a tradition of the natives that the island many years ago was small.

Motley, in 1852 (**3.** 6), referring to the shallowness of these seas, notes, "the natives say that they sow padi where their fathers caught fish," and further on, "the island laid down on the old chart of Dalrymple under the name of Pulu Pusania is now no longer an island, nor even is it called so. It is connected with the main by a neck of low land and its style and title altered to Tandjong Sari Besar."

In British North Borneo, within quite recent times the mangrove-fringed Menkabong river has almost been reduced to a salt-water lake, having so silted up that only light craft can now cross the bar under favourable conditions, and it is necessary to pass over a neck of land into Gantisan Bay to pick up the larger boats. The waters of the coast area are brackish in composition, owing to the enormous body of fresh water carried out to sea by the rivers. A fine silt is constantly deposited over the sponge and coral beds round the coast, and these conditions naturally explain the limited growth of marine algæ.

Alluvium formation has, however, in North Borneo by no means the extent and importance it possesses in other parts of the island, as according to Posewitz (**12.** 241), "the great development of sea-sand on the north coast hinders the formation of morass."

On the west coast there are four principal rivers: the Tampussuk and Tuaran in the north, which rise from Kinabalu; the Papar river, from the Crocker range, and the Padas river, from the Limbakauh mountains, in the south. The Pengallan river, which waters the interior, flowing parallel to the coast, arises apparently in the Trusmandi range, traverses the plains of Kaningau and Tambunan on its course, and falls into the Padas at Tenom.

The Tampussuk, Tuaran, and Papar rivers flow through rich alluvial plains on their lower courses ; on the other hand the Padas river passes through swamp forest, which is, however, very restricted compared with the area occupied by a similar formation in Sarawak.

The parallel sandstone ranges bordering the coast are as yet unsurveyed. They are very steep and of a switchback character, as seen from the sea. Captain Learmonth, R.N., who has taken part in the Admiralty Surveys on the north coasts of Borneo for many years, informs me they range from 4000–5000′ in height.

Posewitz refers to the peculiar mountain structure of Borneo, with its isolated mountain ridges and mountain islands lying in hill land. This feature is also evidenced in British North Borneo, where on the west coast the Limbakauh mountain in the south, supposed to be 10,000′, and the Walker range, up to 5000′, bounding the Pengallan river, stand out alone. The Trusmandi range near Tambunan approximates to 8000′, with Kinabalu running up to 13,440′ ; while the Crocker, an extensive range, about 5000′ in height, runs parallel to the coast and at about 12–20 miles from it. Dr. Stapf (**17.** 76) queries whether the Southern spur of Kinabalu does not run down to the Padas river, in which case it would form a portion of this range. Captain Learmonth, however, to whom I am indebted for the above information, does not consider such to be the fact ; he has taken all the altitudes, and is certain that there is no sustained connection, the intervening hills showing a series of breaks. The Southern spur of Kinabalu does not run out for any great distance, and the mountain is isolated in its orographical character like the so-called Crocker range.

2. Meteorology.

In the following table from the Meteorological Report for British North Borneo in 1906–1907 (it has been impossible to obtain complete returns for the whole year of later dates), the mean temperature and rainfall are given for three localities in the provinces Dent and Keppel on the west coast, viz., at Jesselton, Beaufort, and Sapong, for the two years.

It will be seen that at Jesselton, on the sea-coast, the temperature is very constant, ranging from 91–72° F., while the mean rainfall is 98·33 inches. At Beaufort, 57 miles inland from Jesselton, the temperature shows less variation, the maximum and minimum being from 92–76°, whereas the annual mean rainfall is very heavy, being 158·57 inches, possibly due to the fact that that station is surrounded by steep hills, the Rayoh to the north and the Panggi to the south.

At Sapong, on the contrary, about 35 miles farther inland, and situated in open rolling country on the south side of the Panggi hills, which no doubt condense the moisture in the clouds as they pass over them, the mean rainfall for the two years is only 61·03 inches.

MEANS OF 1906 AND 1907.

	Jesselton.			Beaufort.			Sapong.
	Temperature.		Rainfall. Amount in inches.	Temperature.		Rainfall. Amount in inches.	Rainfall. Amount in inches.
	Max.	Min.		Max.	Min.		
January	91°	72°	0·64	93°	75°	6·17	5·4
February	87	71	3·15	95	77	8·24	3·1
March	89	71	1·99	94	77	8·5	5·94
April	91	72	3·08	93	75	18·4	6·32
May	91	72	7·24	94	76	12·85	4·59
June	89	70	10·12	93	76	18·21	7·98
July	92	72	13·36	91	73	14·84	6·09
August	91	73	15·21	92	75	14·55	3·54
September	92	73	9·91	92	74	7·87	2·64
October	91	73	11·47	94	76	18·82	5·84
November	91	72	12·85	95	78	14·86	3·29
December	92	72	9·31	93	75	15·26	6·3
Annual Mean & Total	91	72	98·33	92	76	158·57	61·03

This difference in the rainfall, amounting to as much as $\frac{1}{3}$, does not apparently affect the luxuriance or variety of species in any marked degree, nor is, to compare with European conditions, a rainfall of 50 inches unusual for certain countries, as, for instance, Ireland and some parts of England.

It is therefore questionable whether the phytogeographical term "rain forest" can be correctly applied in this instance in the wholesale fashion which is accepted at the present time for certain tropical areas, and finds expression in the sweeping inclusion of a country the size of Borneo in one phytogeographical unit. In fact, as regards this country, I should say that the rain forest of perpetual moisture and "drip tips" is conspicuous by its absence.

Secondary and, to a small extent, primary high forest in Junghuhn's sense are the two prevailing plant-formations of the country. The former must be even more pronounced in Dutch Borneo, which I believe carries a much denser population and is almost entirely under sporadic clearing and cultivation.

3. GENERAL PLANT-FORMATIONS.

Secondary Formations.—It is difficult to speak from our very limited knowledge of the general floral conditions of the country investigated, but there is no doubt that the whole of the coast region, judging from Motley's,

Fraser's, and Creagh's collections, shows widely distributed Indo-Malayan types, with the usual immigration flora where European or native settlements occur, excepting the coastal swamp forest, which remains untouched by it. Of the Kinabalu mountain types of my own collection, which is practically limited to the interior, not one is represented in the collections mentioned, and the same may be said of the primary high forest formation. The whole country with its endless hill ranges, ranging from 3000–5000′, is covered with what may be called well-worked secondary forest. That is to say, it is all thoroughly well known and mapped out into respective proprietary zones, by the Murut tribes in the south, and the Dusuns in the north. This ownership means that areas are cleared every year for the cultivation of the hill padi and other crops. These cultivated areas represent more the needs of the whole community rather than individual requirements, as they seem to be worked on a definite plan through a series of years.

As the Murut "campongs" are mostly in the valleys, platforms are erected on the temporary clearings in the hills, which may be some distance off. These fragile platforms, with only a sloping screen on one side for protection against the prevailing wind, hold one or two large jars for arrack, an intoxicating liquor distilled from the rice, and a few cooking utensils. At harvest time the weird music of rhythmic drums sounds all through the still clear nights, an expression of primitive hospitality, inviting all and sundry to an arrack symposium. Each family spends the necessary time at the necessary season on its individual platform in what we may term the communal area for the cultivation of the all-important hill rice, which I was told does best on the steepest inclines, the finest jungle being always cleared for the purpose. I noted that with the Muruts, although accounted a very primitive jungle folk, the steeper the inclines the smaller are the areas cleared, and in the case of the Dusuns, a very intellectual and industrious race, substantial gallery woods were invariably left fringing the water-courses, both admirable rules.

The ubiquitous "Lalang" grass, generally described as "a tropical curse," covers these areas when cultivation ceases, and it struck me that the creeping intermatted rhizomes form an admirable binding agent for the surface soil, which if exposed would be soon washed out by the heavy rains. Nor is it permanent, as a jungle growth of certain pushing and more or less ombrophobous, large, herbaceous plants and shrubs soon intrudes on the "Lalang," which is gradually smothered as soon as shade conditions establish themselves, and so facilitate the immigration of the mesophytic surrounding forest flora.

The tops of the ridges, when very steep and occupied by groves of fruit trees, do not seem to be interfered with by the natives, who, according to

Whitehead (**16**. 112), thoroughly appreciate the various stages in the forest growth, and distinguish them by different names.

Certainly the "untrodden jungle" of fiction seems to be as non-existent in this country as the "rain forest" of science. Everywhere the forest is very well worked and has been so for generations. Murut guides always follow paths, right up to the ridges, which though often undistinguishable to an untrained eye, are of known direction to them. For the jungle produce, rotan canes, evidently ready for cutting, can be seen pulled out in a conspicuous position ; dry grass, the remains of camps, suggest valued fruit trees ; heaps of dammar, accumulating till the requisite load for the dammar baskets is made up, mark the buttressed stems of the "Salan" trees, while concern is palpably shown if one incises the bark to determine a possible latex-bearing vine or tree.

The true home of a jungle people is the jungle, which is to them what our agricultural and pasture land is to us. The Bornean forests have been systematically worked by the inhabitants and their produce, passed on to Chinese agents through the intermediary of the coast tribes, has been the principal source of the Chinese supplies of rotan and malacca canes, camphor, dammar, birds' nests, bees and wax, the finished products of which have been distributed from China throughout the world. It was the jungle, again, which supplied the principal wealth of the ancient capital of Brunei, the seat of the Sultans of Brunei, who reigned supreme in Borneo at the time of the Portuguese domination.

Portuguese writers describe the Malayan seas as swarming with junks and galleys bearing the produce from the Bornean forests to the markets of China, and Chinese colonies were established at the most fertile places along the coasts, resulting in much inter-marriage with the native tribes. It is to this intercourse that the superior qualities of the Dusuns is ascribed ; Tamils or fairs have been and still are held all through the country at different localities and definite times, when the produce of the interior, in the shape of tobacco and rotans, and hats, mats or baskets made of the latter, are bartered for the salt made from the Nipa palm, and for dried fish, both supplied by the Bajow tribes of the coast.

In former days the population was very much in excess of the present scale. Recently the people have been decimated by smallpox and cholera epidemics, which have limited the natural increase of the population to a much greater extent than former head-hunting proclivities. But now, as the white men and rubber plantations penetrate more and more inland, so the Murut gradually is driven further and further back. With the destruction of the forests, he is deprived of his livelihood, and his wild soul will never tamely submit to work as a coolie on the hunting-grounds of his ancestors.

Primary Forest.—Of the flora of the upper ridges of the mountain "islands" nothing is known, outside Kinabalu, where, one is inclined to think, the great height and granite formation of the core must call forth special conditions not obtaining elsewhere.

On the hills above Tenom, where there is only a scanty Murut population, primary high forest begins at 2000′, and is limited to steep ridges, but in the interior I saw no primary forest at all, as the districts passed through were fertile and well populated.

Primary forest is characterised by the size of the trees and the herbaceous nature of its undergrowth; there is also little sub-staging, as the smaller trees and undershrubs appear to be chiefly forest trees in their younger stages. Its majesty is unmistakable, but an exact knowledge of its component parts, especially in the case of the trees and epiphytic associations, will be always difficult to realise.

In North Borneo epiphytic rhododendrons seemed to mark this formation, as I did not see them at all in the secondary forest; but perhaps one should not attach too much importance to this factor, as *R. Brookeanum*, one of the show plants of Kinabalu, is found on mangroves in Sarawak. Warming, in 'Œcology of Plants,' 341, quotes Schimper in stating that woody epiphytes require the heaviest rainfall, so that the presence of these plants is possibly referable to that factor, which dominates on the spurs of Kinabalu.

On this mountain, primary high forest may be described as forming a wavy line, beginning at 3500–4000′ on the south and south-western slopes, running up to 4500–6000′ on the spurs and considerably higher in the valleys, but I should hesitate to say that this forest is the result of altitude or any especial geological or edaphic features. The most vital factor for its development seems to be a very sparse population, to whom the secondary or younger forest suffices for its economic needs, whilst the clearing of the older forest offers too many difficulties for limited numbers to cope with. On the northern slopes of the mountain the level of the high forest is much lower than towards the south and south-west. Mr. Maxwell informed me that over a large area of low-level land to the north of Kinabalu, where there is no native population, only high forest prevails.

The excellent collections made by Beccari, Haviland, and Hose in Sarawak, afford a good basis of comparison as regards the primary forest types.

In that part of the country it is the mountain islands which have been chiefly worked botanically, as they are most accessible from Kuching. They are comparatively small in area and run up to about 3000–5000′, rising out of an immense swamp forest. These islands have not been cultivated by the natives, but chiefly worked for jungle produce. In Sarawak the inhabitants, up to the inland ranges, are chiefly Sea Dyaks, more or less

limited to their pile dwellings on the magnificent river-courses which form the only means of penetration into the interior. Consequently those mountain islands are clothed with primary forest, and in this many of the Kinabalu high forest types are represented. Further investigation will no doubt add to this common element. Meanwhile many of these types have also been found in the secondary forest of North Borneo, this being especially marked about Tenom.

II. ITINERARY AND DESCRIPTIVE ACCOUNT OF THE VEGETATION.

1. JESSELTON TO TENOM.

The capital of British North Borneo is situated on Gaya Bay, where the spurs of the surrounding sandstone ranges break up towards the seashore into low foothills. Between these hills flows a small river, which forms a mangrove swamp at its mouth, graced by a picturesque Bajow pile village.

By the mangrove swamp were the usual members of this association on the land side, such as *Lumnitzera coccinea*, *Glochidion littorale*, *Commersonia echinata*, *Wormia suffruticosa*, *Acanthus ebracteatus*, the wax-covered *Cissus hastata* and *Flagellaria indica*.

Above the village the river-bed had been drained, the mangroves uprooted and a fine golf course laid down, which abutted on a sugar plantation on the old mangrove soil. As the level of the ground rose young secondary forest began, which in the natural course of events had displaced the mangroves as the silt brought down by the river gradually raised the level of the ground. On the edge of a road which bounded the forest I collected *Trema amboinensis*, *Alphitonia excelsa*, *Buchanania florida* var. *lucida*, *Guioa pleuropteris*, *Artobotrys suaveolens*, *Rhodomyrtus tomentosus*, and the abundant and pretty herbaceous shrub, *Pavetta sumatrensis*, covered with corymbs of white flowers.

It sufficed to cross the road to find an association recalling vividly the Roturua district in New Zealand. Where it cut through the sandstone, a small plant of *Anisophyllea trapezoidalis* was seen growing against the side, a tardy remainder from the original forest, then, farther up the bank, a scrub growth succeeded, where the graceful shrub *Bæckea frutescens* with its wand-like branches might, but for the smallness of the flowers, have been taken for *Leptospermum ericoides*, whilst the typical rigid *Styphelia lancifolia*, with its glistening leaves and minute furry flowers, and *Gahnia tristis*, showing its dark brown spikes in abundance, increased the illusion. *Wikstroemia Ridleyi* recalled *W. viridiflora*, so abundant in the dry belt in Fiji, and indistinguishable from it in habit and colouring. *Nepenthes gracilis*, swarming over the grasses and up any support which did not screen it from the breeze, seemed the only representative of Malaya, while the

fastigiate large-leaved shrub or small tree, *Symplocos oblongifolia*, was conspicuously dotted about, representing a Philippine element. This association seemed typical for the small spurs which had been drastically and suddenly cleared, and whose inclines were gashed in all directions by what in South Africa are graphically termed "wash-outs," there being nothing to hold the soil together, while the surface was hard and oxydised from exposure to atmospheric influence. Soil progressively impoverished and sterilised only supports a xerophyllous ombrophobous vegetation, a condition which even the large rainfall apparently cannot influence.

To the north of the harbour the sandstone spurs dip to the sea, forming regular cliffs, clothed to the water's edge in their natural verdure. *Podocarpus polystachys* (♂ and ♀) were growing almost on to the sandy beach, and on a trunk, dislodged and lying on the latter, a beautiful *Dendrobium crumenatum* (pigeon orchid) was in full flower, a rather interesting fact, as Captain Learmonth informs me that the vertical rise and fall of tide in North Borneo ranges between 6 and 10 feet.

On the tops of the surrounding ridges small native clearings were to be seen covered with "Lalang."

South of the mangrove swamp, a sandy level stretch, where the sea shows through a distant fringe of Casuarinas, has been utilised for the race-course. This area was boggy and wet in parts, and the whole carried an interesting sand-pan association. The drier sandy surface was thickly studded with the little yellow *Utricularia bifida*, the minute purple *Salomonia cantoniensis*, *U. callophysa*, the pretty blue flowers of *Burmannia cœlestis*, and the red prostrate tufts of *Drosera Burmannii*. *Oldenlandia diffusa*, *Vandellia scabra* with white flowers, and the bright blue *V. crustacea* were abundant weeds, while *Fimbristylis meliacea*, *Xyris anceps* (?) with *Eriocaulon sexangulare* and *E. truncatum* formed masses in the boggy parts, where *Callicarpa cana* was also growing.

The little light railway from Jesselton to Tenom, a distance of 87 miles, skirts the coast as far as Kimanis Bay, passing principally through swamp forest, where clumps of Sago palms and the beautiful *Cyrtostachys lacca*, with its red leaf-sheaths, were most conspicuous.

This formation was broken at Papar by padi fields, while at Benoni it ran right on to the lovely *Casuarina*-fringed beach. This is the famous site of a cave where, until quite recently, a fabulous monster of much fiction and little fact was supposed to reside. On leaving the seashore the track passes through swamp forest where *Commersonia echinata* and a *Hernandia* sp. were seen, till the land gradually rises before Beaufort, where the secondary type of forest is heralded by the first appearance of fine trees of *Parkia Roxburghii* with their beautiful straight white boles.

Beyond Beaufort the steep foothills were strenuously cleared for rubber

plantations, the railway following the Padas river, which here passes in impetuous rapids through a narrow gorge, where sections show banded clays in fantastically contorted synclines and anticlines.

The vegetation is luxuriant. Huge clumps of the giant grass *Themeda gigantea* with the *Matonia*-like *Pteris tripartita* are seen along the railway-track and on open promontories and banks in the river, and a beautiful palm with broad simple leaflets pinnately arranged up the frond, possibly an *Arenga* sp., is very conspicuous on the banks, which are clothed with forest to the water's edge.

Immediately before Tenom we pass through some marshy forest. In one place where the railway embankment has altered the level of the water, a whole grove of derelict trees raises its buttressed trunks from a lonely swamp, forming with the spreading grey branches a landmark suggestive of some ruined cathedral; prostrate logs covered with *Stereum elegans* are exposed, one splendid clump of *Cyperus elatus* emphasizes a picture of desolation, then follow fine trees of *Wormia excelsa*, apparently quite at home in the standing moisture, and covered with huge pale yellow flowers.

2. Tenom.

This Residency is 700′ above sea-level, and has only been opened about ten years, since the construction of the railway, of which it is the terminus.

A little branch line runs up to the Melalap Rubber and Tobacco Estate, ten miles to the east, and Tenom is the starting-point for the bridle-path to the interior, on which Kaningau, about forty miles farther on, is the first station.

The Resident of the Interior, Mr. A. B. C. Francis, resided here with the Treasurer of the district, and their official residences with a comfortable rest-house, the necessary Government offices, and inevitable Chinese "Kedehs," completed the inventory of the place.

Situated at the foot of the Rayoh hills, Tenom commands the wide and undulating valleys of the Padas and Pengallan rivers, the latter bounded to the south-west by a long range of hills about 5000′ high, called the Walker range, while the Limbakauh range, estimated at 10,000′, is seen in the distance to the south-east.

In the valleys long stretches of open "Lalang" on poor soil, recent clearings showing all stages of jungle upgrowth and small plots on the hills for the cultivation of hill padi, break the otherwise preponderating evergreen mesophytic mixed forest.

In the immediate vicinity of Tenom an old Murut "campong" is situated on the banks of the Pengallan river, while several Chinese gardens spread along the Kaningau bridle-path for a short distance. By the "campong" *Erythrina indica*, *Clerodendron Bethuneanum*, *Costus speciosus* var. *argyrophyllus*, *Mucuna pruriens* and *Piper sarmentosum* are casually associated.

Old fruit trees ran along by the river, whose muddy banks are fringed in parts by *Miscanthus sinensis*, the trees shading Murut graves, marked by rudely adapted stems and roots of trees, or pieces of wood, or sometimes only by bowls and scraps of coloured cloth. These graves are always sheltered by the magic plant *Justicia Gendarussa*. Around them an open sort of undergrowth prevails, composed of the shrubby *Otophora fruticosa*, with its huge auriculate stipules and yellow flowers, *Chloranthus officinalis*, *Donax cannæformis* in clumps, the rhizomatous grasses *Oryza Ridleyi*, *Panicum sarmentosum* and *Setaria palmifolia*, all over 1 m. high, to which are added creeping patches of *Commelina obliqua* and *Cyanotis capitata* with its blue flowers, and the weeds *Hypoestes floribunda*, *Scoparia dulcis* and *Elephantopus scaber*.

Masses of *Alocasia macrorhiza* mark the Murut "kebuns" or gardens, which, with a good soil, are soon overrun by a rampant herbaceous upgrowth of *Urena lobata*, *Sida rhombifolia*, *Hibiscus Abelmoschus*, *Blumea balsamifera*, *Hedyotis vestita*, *Solanum torvum* and *S. verbascifolium*—smothered in *Gymnopetalum cochinchinense*—*Lepistemon flavescens*, *Thladiantha cordifolia*, *Passiflora fœtida*, *Ipomœa cymosa*, and the more delicate *Thunbergia fragrans*, while *Merremia nymphifolia* occupies huge areas, successfully inhibiting further competition for the time being—all to be succeeded by a young jungle, where *Melochia arborea*, *Kleinhovia hospita*, *Brucea sumatrana*, *Blumea borneensis*, *Macaranga Tanarius* var. *tomentosa*, *Mallotus molluccanus*, *Acalypha stipulacea*, *Sapium sebiferum*, *Trema amboinensis* and *Commersonia echinata* enter into wild competition for the survival of the fittest.

Around the Chinese gardens, along the bridle-path or on any clearing by an alien habitation that was habitually grazed over, a wonderfully luxuriant growth of grasses prevails, to whose vitality the well-kept tennis courts and the sward surrounding the court-house bore eloquent testimony. The following species were here collected in flower and fruit:—*Paspalum conjugatum*, *P. Kora*, *Isachne rigida*, *Panicum sarmentosum*, *P. patens*, *Digitaria longiflora*, *D. pruriens*, *Ischæmum rugosum* and *Andropogon brevifolium*, all widely distributed.

In ditches by the bridle-path *Hypericum mutilum*, *Jussieua suffruticosa* and *J. linifolia*, *Blumea chinensis*, *Emilia sonchifolia*, *Knoxia corymbosa*, *Myriogyne minuta*, *Eclipta erecta*, *Bidens pilosa*, *Synedrella nodiflora*, *Vernonia cinerea*, *Ageratum conyzoides*, *Oldenlandia diffusa*, *Asclepias curassavica*, *Hyptis brevipes*, *Polygonum flaccidum* and *Pouzolzia indica* are associated with many sedges, mostly in flower; and of these *Cyperus Haspan*, *C. distans* and *C. Zollingeri*, *Mariscus microcephalus*, *Kyllinga brevifolia*, *Fimbristylis diphylla*, *F. meliacea* and *F. Lacei*, *Scleria hebecarpa*, *Rhynchospora Wallichii* and *R. aurea* were collected, which, with the exception of *Fimbristylis Lacei*, so far only known from Burma, are all common tropical weeds.

Stagnant pools and ditches on boggy land were covered in some cases with *Ricciocarpus natans*, in others with *Pistia Stratiotes*, not seen in flower. *Naias graminea* var. *angustifolia* was growing thickly in one pool, and *Nitella acuminata* filled shallow ditches.

Secondary forest clothes the undulating valleys and the foothills which lead up to the ridges of the Rayoh hills behind Tenom to about 2000′. Above that altitude primary high forest prevails. To the west or south-west, where the secondary forest spreads out over a flatter area, it is of a more or less marshy description.

In a small patch of this area which I thoroughly worked over, the trees collected were *Myristica glauca*, *Amoora curtispica*, *Sphærothalamus insignis* with its curious pendent brick-red flowers, *Memecylon lanceolatum* (?) with inconspicuous white flowers, *Leptonychia glabra*, *Antidesma Gibbsiæ*, the shrubby *Microdesmis caseariæfolia* with small yellow flowers, *Saprosma borneensis* and *Chasalia curviflora*; while *Gnetum latifolium*, *Lygodium flexuosum*, *Ervatamia orientalis*, and the interesting liane *Cowiea borneensis* (the type of a new genus), with long spikes of minute flowers, twined round tree-trunks.

This small patch yielded three new species and one new genus. How far it can be taken as representing a marsh-forest association is impossible to judge, as there was no opportunity of working other areas, and indications are wanting on the labels of previous collectors in reference to this special type, which is well represented in Borneo.

On the edge of the forest dense masses of *Albizzia myriophylla*, the woolly *Rubus mollucanus*, the lovely pink *Jacquemontia tomentella* with its silvery foliage, and the shrubs *Flemingia strobilifera* and *Baphia borneensis* were conspicuous.

The commonest forest trees of the lower levels were *Parkia Roxburghii*, *Erythrina lithosperma*, *Arytera littoralis* f. *angustifolia* and f. *genuina*, the latter smothered in its abundant white inflorescence, *Sphærothalamus insignis*, the lovely *Ardisia serrata*, similar in habit and colour to our pink horse-chestnut, *Cassia nodosa*, *Ficus gibbosa* var. *typica*, of which there were magnificent specimens in isolated positions where native clearing had obtained, *Mallotus ricinoides*, *M. mollucanus*, *Macaranga Tanarius*, *Acalypha Caturus* and *A. stipulacea*.

Of common lianes *Conocephalus naucleiflorus*, and *Anthocephalus macrophyllus* almost replace their support with their huge spreading crowns; *Jasminum bifarium* runs up the tallest trees, all the flowering shoots expanding at the top; the massive magenta-red racemes of *Adinobotrys Nieuwenhuisii* hang at intervals down the whole length of the bare stems, while *Pithecolobium fasciculatum* shows its twisted pods with their glaucous bloom and brilliant orange seeds amongst the branching foliage, and *Piper Betle* var. *Siriboa* with

Lygodium flexuosum and *L. circinnatum*, the latter often with fronds 1 m. across, twine up stems. Of Araceæ, *Epipremnopsis Hügeliana* was abundant and in flower. This was also the case with the scrambling bamboos, of which I found a *Dinochloa* sp. showing a flowering rhachis, on which, unfortunately, only the bracts were present. Of the rotans which swept the forest with their armed flagellæ, climbing up and down trees in unrestricted luxuriance, only *Korthalsia*, *Calamus* and *Dæmonorops* sp., the very common *Calamus acuminatissimus* and *Dæmonorops sabensis* were found in fertile condition.

Of epiphytes, magnificent examples of *Platycerium biforme* showed the long fronds hanging down from the topmost branches, whilst *Asplenium nidus* nestled in the lower forks. The large white flowers of *Phalænopsis amabilis* made constant splashes of light amongst the surrounding foliage, often poised on dead sticks which formed the whole support of fine flowering specimens.

Undergrowth was characterised by large groves of the Bamboos *Schizostachyum Zollingeri* and *Dendrocalamus flagellifer*, whilst the fine palm *Caryota mitis* and the *Arenga* (?) previously mentioned were very common in single specimens amongst other more gregarious kinds.

Of undershrubs *Wormia suffruticosa*, *Saurauia ferox*, *Otophora fruticosa* and *O. imbricata*, the scrambling *Microdesmis caseariæfolia* and *Mussænda frondosa* were generally distributed.

The herbaceous undergrowth in parts was luxuriant: in the neighbourhood of moisture or small streams the huge *Stachyphrynium Griffithsii*, with leaves meeting over one's head, *Donax cannæformis*, and many other gregarious Scitaminaceæ and Zingiberaceæ spp. were associated with *Begonia borneensis* and *Calanthe Gibbsiæ*, and here and there with *Dryopteris immersa* and *D. truncata*.

In drier areas herbaceous Acanthaceæ may be said to form the dominant note, chiefly the small *Aporuellia borneensis*, with light mauve flowers, the yellow *Ptyssiglottis Gibbsiæ*, *Ruellia repens* and *Hypoestes floribunda*. The handsome sedge, *Scleria purpureo-vaginata*, over 1 m. high, with leaves in interrupted whorls up the stems, was conspicuous and general. With it were found the smaller *S. lithosperma*, *Fimbristylis asperrima*, *Cyperus pubisquamus*, and the grasses *Themeda gigantea*, *Rottbœllia glandulosa*, *Panicum sarmentosum*, *Oryza Ridleyi*, and the stiff *O. Meyeriana*, a species with creeping rhizomes from which stiff bamboo-like tufts arise, whilst *Commelina obliqua* and *Pollia sorzogonensis* would carpet sections of the ground. Fungi were rather plentiful, the pretty red cups of *Trichoscypha Hindsii* and *T. tricholoma* being generally abundant.

A Murut clearing at about 2000′ seemed to mark the limit of the secondary growth, as, once beyond it, one penetrated into what, to all appearances, might be described as high forest, clothing steep ridges and declivities. The trees here were very fine and well spaced, *Ardisia virens*, *Litsæa oppositifolia*,

Antidesma neurocarpum, and *Lasianthus appressus*, a shrub with blue berries, were collected and a fine *Ficus* seen. On the slopes this forest was characterised by the depth of the humus covering, consisting of dead leaves in all stages of healthy decomposition. The ridges, on the contrary, were drier in type, and the character of the undergrowth evidently responded to this distinction.

On the slopes, where leeches swarmed in rain, fine ferns, absent at lower levels, formed wide-reaching colonies, such as *Cyclopeltis Presliana*, *Dryopteris moulmeinensis*, *Aspidium cicutarium*, *Schizoloma heterophylla*. Palms were abundant in parts.

Higher still, *Begonia pubescens*, *Cyrtandra Gibbsiæ* with large yellow flowers, *Pollia sumatrana* (white), *Globba Gibbsiæ* (white), and another *Globba*, allied to *G. propinqua* (yellow), grew more or less spaced; whilst in a mass of humus at the foot of a tree I found a small group of the delicate little saprophyte *Cotylanthera tenuis*, with light-blue flowers. At 3000′ a clump of *Dendrocalamus Zollingeri* in flower seemed to assert the fact that cultivation must formerly have obtained here. Possibly it was grown from sections left by natives after use as water-vessels, as aptly suggested by Beccari in explanation of a similar occurrence in the primary forest on Matang (**18.** 110). *Piper stylosum* and *Selaginella pentagona*, the latter in erect clumps from 0·50–0·75 m. high, were abundant, together with the beautiful blue-tipped *S. Wallichii* and the creeping *S. alopecuroides*.

On the drier ridges *Ixora stricta*, covered with copper-red flowers, and *Fagræa racemosa* grew as small trees, along with the twining *Parsonsia spiralis*, *Smilax leucophylla* and *Dæmonorops elongatus* var. *montanus*. *Appendicula torta* with *Hæmata heterophylla* and *Davallia solida* were epiphytic. The undergrowth consisted of *Lepidagathis staurogynoides* with pretty yellow flowers and mottled foliage, prostrate or erect, and colonies of the little *Begonia Gueritziana* with small spreading radical leaves and simple flowering scapes. The white *Calanthe Gibbsiæ* and the purple *Miscobulbum scapigerum*, with lovely shaded leaves, were of isolated habit. *Pteris Dalhousiæ*, an interesting record, grew gregariously, while a large group of *Geaster velutinus* was conspicuous in one place.

Both in the secondary and primary forest the absence of foliaceous lichens and thallose liverworts, so characteristic of similar formations in Fiji and New Zealand, is conspicuous. This fact has also been emphasized for lichens in the primary forest in Sarawak by Beccari (**18.** 281).

3. Tenom to Kiau.

At Melalap the Pengallan river skirts the foothills of the Walker range, where, on the densely wooded banks, *Ficus Miquelii*, *Nauclea cyrtopodioides*,

and *Pittosporum ferrugineum* were found in flower, as well as the well-armed *Erythrina lithosperma.*

Many sandbanks were exposed in the river, but all the plants collected proved aliens. *Oldenlandia diffusa, Scoparia dulcis, Phyllanthus Urinaria, Mariscus Sieberianus, Fimbristylis meliacea* and *F. diphylla, Cyperus aria* and *Eragrostis amabilis* formed an "opportunity" flora in a wooded country where plants of that type have generally no chance of germinating. On this estate, originally cleared for tobacco, but now growing rubber as well, a beautiful garden was laid out round the Manager's house, the work of love of a former Dutch manager, showing all the care and taste in planning and planting, which is so pleasing a feature in Java, where no pains are spared to ensure a permanent result. At Melalap, roses flowered all the year and many fruit trees were now in bearing. Such cultured surroundings have also a hygienic value; for to grow rubber or other trees right up to European habitation is against all rules of tropical practice, as they not only impede the free circulation of air, but also harbour mosquitoes.

After Melalap, alien cultivation was left behind and the "rentis" ran through beautiful forest, over perpetual ridges from 2000–3000′; but the grading was so easy that one almost wished for the native tracks, the bridle-paths being made with a view to a future wheeled traffic. Family parties of little Muruts continuously passed by, always in single file, each laden with bundles of rotans, mats and baskets of dammar, and wearing only jacket and chawat and picturesque hats that sufficed against wind and rain. They were all bound to or from Tenom to barter jungle produce in the Chinese "kedehs." In some places Murut graves could be seen, elaborately constructed of wood resembling small houses, with the ends of the uprights whittled into thin laminæ, and decorated with coloured bits of cloth. Wild Pineapples clustered in the small clearings made for these structures.

At Senagong, less than half-way to Kaningau, there is an intermediate rest-house, by some padi fields—where *Monochoria hastæfolia* was growing in a ditch. From here, the "rentis" continues over the same type of country till one suddenly emerges from the forest on to the Kaningau plain.

This plain is 1000′ in altitude and about 20 miles long, a flat expanse surrounded by hills, which we skirted for 4 to 5 miles past Murut "campongs" and padi fields to the Station, beautifully situated on a hill, commanding a view of the whole plain. A few fine trees with a good sward underneath gave a grateful shade while not shutting out the breezes or the view, the buildings comprising the police quarters and the pleasant abode of the District Officer, Mr. W. C. Weedon, whom I had left at Melalap, where he had most kindly made all arrangements for my transport, and lent me his house for the two nights I spent at Kaningau. Here, beyond the

Murut "campong," I was interested to see huge groves of bamboos, *Dendrocalamus Zollingeri*, under which the Muruts evidently stabled their buffaloes, the ground, trodden and sodden by the beasts, testifying to long usage for this purpose. This offered an explanation of what had always puzzled me at Tenom; for whenever one came across Bamboo groves in the forest, the undergrowth never spread underneath, the ground remaining quite bare as if it had been sterilised, an inevitable result of the previous existence of conditions similar to those obtaining at Kaningau, and this, on inquiry, proved to be quite general.

Between the houses and rice-fields and bordering the streams, were patches of wood, where I collected *Harpullia arborea* with yellow flowers, very like some *Pittosporum*, *Claoxylon rubescens*, and *Clausena excavata*. *Albizzia myriophylla*, with *Costus speciosus*, was as common as at Tenom.

In the open, which was all marshy "Lalang," through which the buffaloes cut neat paths, the pretty blue and often white *Exacum tetragonum* was abundant, and drawn up amongst the "Lalang" grass were *Smithia conferta*, *Desmodium polycarpum*, *Dysophylla verticillata*, *Indigofera hirsuta*, with *Mariscus microcephalus*, *Rhynchospora Wallichii*, *Fimbristylis diphylla*, *F. complanata*, *Scleria bancana*, *Sorghum serratum*, and where the "Lalang" was less thick, *Alysicarpus vaginatus*, *Selaginella proniflora*, *Lygodium flexuosum*, *Lycopodium volubile*, and often also clumps of *Gmelina asiatica*, overgrown with *Clitoria Ternatea*. *Antidesma Ghesaembilla* in some places formed little open woods with *Entada scandens* running over the trees. In drier areas *Hypoxis aurea*, *Xyris pauciflora* and *Polygala chinensis* covered the ground.

Leaving Kaningau the "rentis" runs across the plain, passing several streams with fringing woods, where *Fagræa crassipes* with long pendent peduncles, *Blechnum orientale*, the fronds $1\frac{1}{2}$ to 2 m. long, and the charming *Odontosoria chinensis* were growing on the banks, with *Scirpus fluitans* floating on the stream.

When we skirted some sandstone hills, a delicious smell of camphor scented the hot air, and an undergrowth of bracken, 3 m. high, with *Nephrolepis biserratum* almost as long, ran up the trees. A huge *Macaranga* with large stipules, probably *M. megalophylla*, the leaves 0·75 m. and 1 m. in length, which the ever-passing files of Muruts used as sunshades, was very abundant.

At the edge of a clearing just before Apin Apin, *Vernonia arborea*, with large yellow panicles, *Syzygium zeylanicum*, a mass of feathery white flowers, and *Pipturus argenteus* were collected.

At Apin Apin padi was ripening round the Murut "campong," and children were busy on little platforms manipulating an intricate system of windmills and strings, on which the *Macaranga* leaves figured again as scarecrows.

The rest-house consisted of a comfortable structure of bamboo, with another for the coolies, situated by the river, with a lovely view over a series of forest-clad ridges. *Triumfetta suffruticosa* luxuriated on cleared gravelly banks, and fruit-trees of lanzarts, coco-nuts, and oranges were in abundance.

Leaving Apin Apin for Tambunan, the "rentis" crosses some hills and then follows the crest of a sandstone-range, where I lost my escort by riding on, expecting to find them in front of me; however, they preferred the native tracks, which are considerably shorter. They succeeded in turning up next day, having taken upon themselves to pass the night at Parotan.

A lot of clearing had taken place on this range, where *Litsœa citrata* was in full flower, and also *Jambosa rufo-tomentosa*, with white flowers and peculiar red-brown hairs covering the flowering rhachis. Beside the latter species, which, judging from Haviland's material, is also very common in Sarawak, *Carallia lucida*, *Mœsa ramentacea*, *Acalypha Caturus* and *Tetrastigma papillosum* were abundant.

At Parotan, 2000′, in a clearing wildly overgrown with young jungle, was a new rest-house, the old one lying crushed under an endless "Tapang" or beeswax-tree, which had fallen over it. Another "Tapang" was standing alone, in whose tapering branches, almost lost to view, hung bees' nests, rendered accessible by a row of fragile spikes inserted up the trunk. Beccari describes these trees (17. 109) in Sarawak, the species generally being *Abauria excelsa*, Becc., and St. John (7. 75) mentions them in Brunei. The natives mount by the fragile steps, which they bind on the outside with rotan as they ascend, often carrying torches for smoking out the bees. *Rubus rosæfolius* hung in luxuriant masses over a bank in a river, covered with its disappointing luscious-looking fruit.

Fordia Gibbsiœ was growing in one place off the "rentis," which otherwise ran through perpetual clearing in weedy young jungle stage. The late Mr. R. V. L. Pritchard, then Mr. Weedon's assistant, stationed at Tambunan, met me just before the hills sloped down to the fertile plain.

The Tambunan Plain * is a fine expanse, at an altitude of about 2000′, about 12 miles across, and bounded by hills. To the east the Trusmandi range rises above them, while Kinabalu should have dominated to the north, but was shrouded in cloud during the whole of my stay.

Cantering across the plain to the station, I noticed a stretch of *Bœckea frutescens* on some sandy soil, and a small plant of *Bauhinia Kochiana* trailing over a "Tapang," with only one shoot which, flowering freely, showed the ease with which the forest types can reassert themselves. The soil seems of a marly consistency where the padi is grown, alternating with stretches of sand. Tambunan Station is finely situated on a rise about the middle of the plain, which, being about 2000′ above sea-level, is very healthy,

* Tambunan, height 1870 ft.; lat. 5° 40′ 0″ N., long. 116° 21′ 30″ E.

the temperature being always pleasantly cool, while the nights are quite cold for the Tropics.

The vicinity proved botanically interesting. Another sand-area showed a distinct association : passing a damp patch, with the minute *Utricularia callophysa* growing abundantly, a path led on to drier soil, with *Fordia Gibbsiæ* of fastigiate habit, having erect racemes of magenta-pink flowers, *Vaccinium bancanum* with white flowers, and *Vitex pubescens,* all about 3 m. high. White *Dianella ensifolia, Nephrolepis biserratum, Pteridium aquilinum,* and *Rhynchospora glauca* var. *chinensis* formed a dense growth beneath and between these species, in which *Nepenthes gracilis* and *N. ampullaria,* with the beautifully-shaped *N. Rafflesiana,* climbed in bewildering profusion up any and every available support, each plant surmounted by flowers or fruits.

The radical pitchers of these plants were always arranged like water-jars at a well, close together, erect, and half full of water, but I was interested to see that the sensitive petiole of the aerial pitchers would twist round any support, the pitchers standing out in all directions, often upside down, a circumstance Professor Macfarlane explained by the fact that these aerial pitchers are intended to be blown about by the wind, as the movement increases the secretions of the digestive glands.

Beyond this sand-area, the ground sank to ragged secondary forest full of buffalo wallows. Here *Dryopteris unita, Xyris pauciflora, Burmannia cœlestis* favoured an open boggy patch ; while in the forest, *Cratoxylon arborescens,* with its quaint red stems, flowers, and fruits, was veiled in *Hoya coronaria,* whose branches hung down in curtains bearing corymbs of its large green flowers. A form of *Saurauia ferox* showed red hairs on the calyces of its transparent white flowers, but otherwise could not be distinguished from the species. *Decaspermum paniculatum* was covered with its little May-like blossom, and *Loranthus centiflorus* with conspicuous dark red flowers, so far only known from Kinabalu at 6000′, was an interesting find. *Phaius Blumei* was very handsome in several clumps near the buffalo-wallows, where the beautiful *Arachnis Hookeriana* ran up trees for about 3 m., sending out its lateral racemes of rose-mauve flowers.

In the open, near the "kedehs," I found *Buddleia asiatica, Rubus rosæfolius,* and *Ocimum Basilicum,* which, according to Mr. Pritchard, the Dusuns use as a vegetable. The noticeable absence of the weeds so luxuriant at Tenom, and present to a much lesser extent on the "Lalang"-covered plain of Kaningau, was a most interesting fact, as Tambunan has only been opened a year or two, being the farthest station in the interior up to the present.

The Tambunan Dusuns are a very industrious and intelligent race, and Mr. Pritchard was enthusiastic about their many good qualities in comparison with the lazy Muruts of Kaningau. They have a regular system of rice-cultivation, in irrigated terraces, and their charming little bamboo houses dot

the plain for all the world like Swiss chalets, except for the banana, coco nuts, and *Areca Catechu* palms, which are always planted round their dwellings.

It is a tradition amongst these people that the plains of Tambunan and Kaningau were formerly lakes, formed by the accumulation of material brought down by the Pengallan river. In a time of great flood these barriers were broken through again and the waters from the lakes escaped in a devastating flood. The small plain of Ranau, near Kinabalu, about 15 miles east of Renagong, in the Tambunan district, is, according to Mr. Pritchard, who knew it well, covered by water-worn granite blocks, which could only have been brought there by water-transport from Kinabalu, as there is no other source of granite in the neighbourhood.

Should this tradition of the Muruts and Dusuns prove correct, it would substantiate the more widely spread one of the fabulous lake of Kinabalu, with its thriving inhabitants, which obtained such wide credence in the works of the earlier writers on North Borneo—Keppel (**1.** Ap. 11, lix) and St. John (**6.** 221).

This suggestion has already been made by Posewitz (**12.** 233) in the following passage :—"The name 'Danau' is characteristic for such plains. This gives an indication of their mode of origin, for *Danau* denotes a lake." Similar cases occur in S. Borneo.

The plain rises towards the north, where one enters the forest-clad foothills, in which small padi-clearings were numerous. One very fine oak-tree was conspicuous by the "rentis." *Wendlandia paniculata*, with long handsome white racemes, was abundant, with *Bauhinia Kochiana*, a mass of lovely flowers, the petals first cream, the reverse side turning red, and large red stamens, and *Dioclea reflexa* ; also *Ixora stricta*, with the spreading *Selaginella pentagona* and the pretty pink *Sonerila maculata* var. *glabrata*, whose pink leaves with red undersides carpeted the ground, and *Syzygium Cumingianum* with minute flowers and shining leaves.

The "rentis," gradually rising to Patau Patau, was fringed with *Clethra canescens*, and showed a lot of white sand. This rest-house is beautifully situated at 2600′ on loose white sandy soil. A luxuriant growth of bracken has sprung up in the clearing all round, the red cup-lichen, *Cladonia Floerkeana*, carpeting the ground amongst it; *Clethra canescens* was also abundant. A little farther on, the path cut across a stretch of *Bæckea frutescens*, then descended into the forest.

The weather, which had been gorgeous since I landed in the country, now broke, torrential rain falling day and night. As the rivers rise rapidly in wet weather, and all have to be forded, progress may be considerably delayed.

To get to Korikut, the next stage, the usual ford was impassable, and we had to camp for the night on the banks. I was much impressed by the

cheerful way in which the Dusun carriers—everything has to be packed on men's backs—under the able management of the two policemen sent with me as an escort, accepted and overcame all the vicissitudes inevitable in such soaking conditions, and wondered how a heterogeneous group of so-called civilized Europeans of the same class would come out of such an ordeal.

A fine example of *Casuarina nodiflora*, near Korikut, was the only one seen by me through the country. Beyond Korikut we passed a stretch of secondary forest, in which *Alpinia sericea*, with a terminal raceme of creamy orange flowers flecked with red and 30 cm. long, was a conspicuous object about 2 m. in height. *Dioclea reflexa*, with purple flowers, and the handsome *Pandanus Gibbsianus*, with branched stems and clustered black inflorescences, was abundant on the ridges as undergrowth, whilst the trees *Ligustrum robustum*, *Clethra canescens*, *Acalypha stipulacea* and *A. Caturus*, *Pouzolzia viminea*, *Astronia smilacifolia*, and *Ficus chrysocarpa* as a shrub or tree, were collected along the "rentis." Red gourds, spherical in shape, flattened at each end, were suspended on long thread-like pedicels in quantity from the trees, the plants showing no leaves, and *Gynura sarmentosa* was generally scrambling in sunny places.

Soon we emerged on a long ridge, skirting a valley, at about 2000′ above it. The land here was entirely cleared; substantial woods, however, fringed the streams which flowed down the sides. Picturesque little Dusun villages were perched in all directions on the sides of the valley and on the ridges, often only indicated by the indispensable coco-nuts, *Arecas*, and bananas. Sweet potatoes were always planted round the houses, along with small tobacco patches and various gourds which made excellent eating, and maize in perfection of cob was a joyous sight.

Finally, rounding a spur, we dropped down to Mensangau, where we had to pass the night, the river being too high to cross. Here I collected *Marchantia emarginata* on a bank, and *Equisetum debile* was abundant by the river.

When crossing the Mensangau next day, we found, judging by the vegetation on its banks, that the river had fallen almost 1 m. in the night. Even then there was so much water that the three biggest men had to carry all the loads across.

The path on the other side rose steeply on sticky clay through forest, and its condition gave some idea of the ceaseless labour these paths entail. Every one of the many angles was washed away wherever streams came down, and only the tenacious nature of the clay enabled the pony to get over. As undergrowth, *Pollia sumatrana* and *Hydrocotyle javanica* were growing in patches, and a beautiful clump of bamboo, with a magnificent flowering shoot on a separate stem about the same height as the vegetative

branches, proved to be a new species of *Gigantochloa*, *G. heteroclada*. A handsome male *Laportea* showed fine tassels of pendent pink flowers, unfortunately out of reach.

The country now was all cleared ridges with many campongs. Before Renagong, we passed some forest of quite a different character to any seen before. Here *Clethra canescens* formed an understage, while fine trees of a symmetrical *Eucalyptus*, possibly *E. alba*, rose abundantly, exposing the whole of their straight white boles, with ragged bark hanging from the lower branches.

Farther on the path has been washed entirely away for some distance, and the pony had to be sent back to Tambunan in charge of Mr. Pritchard's plucky little syce. The rest-house here again was in a wonderful position, situated on the slopes of the range at 2700′, and commanding a view up the long valley, which stretched away on both sides.

Kinabalu's lowering peaks, however, the chief glory of the view, were completely invisible, from the persistent rain and mist.

From here it was a question of up-and-down native tracks, over perpetual clay and extensive clearings, cultivation, and recent jungle, to Kiau, and offering little of interest botanically or otherwise, and of ceaseless rain. At Renagong the campong showed large communal houses with green-sward in front close-cropped by buffaloes. After Bundu Tuhan we passed over the southern spur of Kinabalu, where, on Tenumpok ridge, there is a patch of fine primary forest. The trees were very high and evenly spaced, with little undergrowth, and the ground in places was strewn with the corollas of a large yellow *Rhododendron*, possibly *R. Brookeanum*. *Begonia adenostegia*, found by Haviland on the Kinataki at 4500′, and *Elatostema tenumpokensis* were amongst the herbaceous undergrowth. In one place where forest had recently been felled, a catch-crop of kladi had been planted amongst the logs, the ground being thus utilised till the wood was dry enough for burning.

We soon, however, emerged from this pleasant break into the rankest secondary growth again, and, making our way down a subsidiary spur, all clearing, struck the Kadamaian river, following its bed, choked with enormous blocks of granite, till we came to the Kiau ricefields and a passable bridge.

4. Kinabalu.

a. **Kiau.**

Arriving at Kiau was like treading on classic ground. The steep pull up the river, in the usual downpour, by the narrow slippery native path, disdaining any attempt at a zigzag, and the little bamboo-built chalet-like

houses clinging to the roof-like hillside, all vividly recalled Low's, St. John's, Burbidge's, and Whitehead's graphic descriptions.

At the middle village, Mr. Bunbury, the officer in charge of the district and stationed at Tuaran, came out to meet me. He had arrived two days before with his assistant, Mr. D. R. Maxwell, from Kotabelud. The weather had been abnormally bad all over the country, and they had had some difficulty in crossing the Tampussuk when coming up from the coast.

Mr. Bunbury left the next morning, Mr. Maxwell remaining behind to organise the expedition up the mountain should the weather improve. But prospects were not encouraging, the first stage being through the bed of the Kadamaian river, the local name for the head-waters of the Tampussuk, a mountain torrent, impassable in flood.

All the second supply of stores had been brought up to Kiau from the coast, including "Kajangs" (mats made from the Nipa palm, used for walls and roofing) and some constabulary blankets, the latter very thoughtfully sent up by Major Harrington, the Chief of Police, for the use of the coolies in the event of the ascent. Amongst the usual crowd of natives squatting in the public apartment of the rest-house, Sumpat, an oldish man of self-respecting appearance, was presented as the head-man of the village. He immediately handed me a letter written by Haviland, stating that he had acted as guide to him in his expedition up the mountain. My mind was already full of the previous experience and the results of those whose devoted work had rendered this mountain a Mecca to biologists of the present day, and that letter seemed almost an augury from one whose unknown fate in South Africa was met in the quest of his life's work. Next to Sumpat was a nice-looking boy of about 16, Umpoh, the son of Kaboung, the last head-man of Kiau, whose name is so often mentioned by Whitehead in his admirable work on this mountain, on which he spent three years collecting the fauna and especially the avifauna, and whose ascent, after being twice baffled in his efforts, he finally achieved under very favourable conditions.

The Dusuns of Kiau all speak the Dusun language, but one Lamat, the potential head-man of the place, who had three ascents to his credit, could speak good Malay, having been to Singapore with Walterstadt, one of Rothschild's orchid collectors, who was the last person known to have ascended the mountain. Lamat was to be our guide in chief, and proved, of course, invaluable to Mr. Maxwell in the endless preliminary discussions and arrangements, and I also found him a most active and interested coadjutor in collecting plants.

My first care at Kiau was to establish a Javanese boy in the cook-house where a good fire had to be kept going night and day, for the purpose of drying the material collected. This boy was very kindly procured for me by the authorities at Buitenzorg, and had been out with many well-known

botanists in Java, and his time at Kiau was wholly spent in solemnly turning over papers and specimens before an admiring Dusun audience. A Manila boy who had been in the police, and was kindly found for me by the Governor, always accompanied me on my trips and helped with the collecting. Kiau is a very scattered village, and one marvelled that the Dusun chalets clinging to the steep slippery slopes are not washed down by the tremendous and continuous rain that generally prevails here. Their preservation is only to be attributed to an instinctive care, no doubt the result of the experience of generations, which would do credit to a Forest Department. The higher slopes and ridges are left in permanent forest ; the lower slopes are protected when cleared by leaving intersecting belts of trees and fringing woods to the streams. On any steep cultivated slope horizontal logs are laid to prevent the washing away of the surface-soil.

To teach these intelligent and industrious people to terrace their hills for permanent cultivation would be a simple process after a little practical demonstration of the value of such a system. European vegetables could then be supplied to all the coast stations once they had ocular proof of the value of such crops. But as the Dutch found in Java, it is useless simply to distribute seed and instruction. Practical experiment can alone show the use of methods and crops different from those to which they are accustomed.

Every day during my stay at Kiau a continual supply of kladi, sweet potatoes, gourds, corn cobs, green oranges, and bananas, the latter surprising in their variety, some being barely 1 cm. long, was brought in by the attractive little Dusun women, who were also responsible for all the wood supplies. I was constantly asked to exchange piles of copper cents, the bulky currency up-country, for one dollar notes ; this certainly showed a latent commercial spirit which it would take very little encouragement to develop.

The natural riches of a country are supposed to exist in a prosperous and well-to-do population. It is to the scientific study and exploitation of this fact that the extraordinary development of Java under the Dutch administration is due, and there is nothing in the fertile soil, the temperate climate and the industrious population of the highlands of British North Borneo to prevent the achievement of a similar result.

At Kiau, in the immediate vicinity of the houses, a good turf sward is kept cropped by buffaloes. The padi fields, runningup the hill to the village, were bare and covered with a crop of *Salomonia cantoniensis* and *Cyperus Haspan*. These fields continued to the east and west, alternating with the ample fringing woods of the many streams which scored the slopes to flow into the Kadamaian. Much weedy jungle separated the different groups of houses. This I did not work through, as it seemed very similar in character to that already described for Tenom.

Following the bridle-path towards Koung, to the west, after passing present

cultivation, tangled areas of *Miscanthus sinensis*, *Dipteris conjugata*, *Pteridium aquilinum*, and *Gleichenia viridissima* were succeeded by secondary forest of recent growth. It is this area, in fact, which is alluded to by Burbidge (**9.** 95) as having been under dry-rice cultivation in 1877. Here *Pithecolobium microcarpum* was found in flower, *Ficus Gibbsiæ*, with red receptacles, *Itea macrophylla* and *Semecarpus Bunburyana* about 3 metres high, with fine terminal racemes of white flowers supported by a whorl of large leaves at the ends of the lanky branches. Also *Kibessia tessellata*, collected by Haviland at Koung, a most original plant with mauve flowers resembling *Solanum Wendlandii* in size and the colour of the corolla. Groups of gregarious palms clothed the sloping sides of streams, the slender *Pinanga Gibbsiana* being in flower and conspicuous with its red pendent fruit, while tree-ferns, markedly absent elsewhere, were another prominent feature, *Angiopteris evecta*, *Cibotium barometz*, *Cyathea celebica*, and *Alsophila glauca* being common everywhere. *Curcuma Zedoaria*, *Medinilla speciosa*, with the fern *Didymochlæna truncatula* and the terrestrial orchids *Spathoglottis aurea*, *Ascotainia borneensis*, and *Cœlogyne Sanderiana*, formed part of the undergrowth, which in many places consisted of bracken about 3 m. high that had to be beaten apart to allow of passing through, tufts of *Leucobryum javense* dotting the ground underneath.

Of epiphytic orchids the magnificent yellow *Eria Gibbsiæ*, forming big clumps on old tree-stumps, and *Vanda Gibbsiæ*, with shoots about 1 m. long and large yellow flowers, were very common.

Above Kiau, recent jungle of immigration plants, with open buffalo pasture between, reached to about 4000′. This apparently is the limit of cultivation, at any rate at present, and also of the secondary forest.

b. Gurulau Spur.

Gurulau is a spur above Kiau, which was not visited by Haviland. Here primary forest began at 4000′, but it was not very high, the slopes being too steep to allow of the full development of large trees. As the sides are clothed in thick forest, it was only possible to follow the ridge. Here the trees averaged 13–16 m., among them *Urophyllum streptopodium*, with green flowers, *Mastixia trichotoma* (?) white-flowered, the interesting mauve *Ardisia Copelandii* with flowers rather large for the genus, *Viburnum vernicosum*, *Ardisia Zollingeri*, *Ficus Gibbsiæ*, the red-flowered *Loranthus Maxwellianus*, so large in size and with such distinct flowers that I took it for a *Helicia* and labelled it "a tree"—whilst *Clerodendron kinabaluensis*, with long wandlike branches terminated with pleasing white flowers, *Rubus glomeratus* with red berries, the red-flowered *Dissochæta rubiginosa* and the terrible flagellæ of *Dæmonorops elongatus* var. *montanus*, pushed their scrambling

branches through the foliage. *Gleichenia Norrisii* ran up through the undergrowth for about 2 m., and in a more open space *Pterisanthes cissoides* spread over the ground.

The undergrowth consisted towards the base of the spur of *Polygonum chinense* with great clumps of *Alpinia flava*, 3 m. in height, the fine *Cyathea celebica*, also common lower down, and the acaulescent *Cibotium barometz*, whose magnificent fronds, over 5 m. long, associated with those of *Diplazium polypodioides*, the latter measuring over 2 m. in length.

Higher up the pretty pink *Phyllagathis elliptica*, *Ophiopogon malayanus*, *Hedyotis pulchella* var. *magnistipula*, the yellow *Staurogyne axillaris*, *Elatostema gurulauense*, and, at the base of trees, *Balanophora Lowii*, with its quaint fawn-coloured cones, were common, as well as the orchids *Goodyera kinabaluensis* with its lovely pink-veined leaves and *Eria cymbidifolia*, an acaulescent, pink-flowered species.

The typical *Cheiropleuria bicuspis* occupied more open spaces with the spreading *Lindsaya pectinata*, in company with *Lycopodium serratum*, *Tapeinidium pinnatum*, and *Selaginella plumosa*. A large patch of the giant moss *Dawsonia altissima* recalled *D. superba* of New Zealand and Australia, but was of more luxuriant appearance, with thinner and longer leaves. On the top of the spur, at about 5500′, modified mossy forest prevailed. Moss had covered the trunks of the trees up to now, but here it also overran the prostrate logs which encumbered the ground and growing upon which *Lophatherium gracile*, *Carex filicina*, and various orchids were conspicuous.

From 4500′ upwards, the small ferns, *Cyclophorus adnascens*, the tufted *Polypodium cucullatum*, the minute *Hymenopyhllum aculeatum* and *Schistocheila Wallisii* were epiphytic at the bases and on the trunks of trees, associated with the epiphytic orchids *Trichoglottis kinabaluensis*, *Eria rubiginosa*, *Dendrobium villosulum*, and *Liparis disticha*.

c. Maraiparai Spur.

When the rain began to abate a little, the Dahobang river, which had been in flood, was reported passable. As Kinabalu itself was still out of the question, we decided to spend a day or two on the Maraiparai spur, situated between the Dahobang and the Kinitaki rivers—beyond which are the Sadikan, a very small river, then the Melumban (Limbun), which joins the Kadamaian below Tambatuan, and the Penataran, a tributary of the Kadamaian, or Tampussuk.

The path kept to about 3500′, crossing the Kiulan, Haia Haia, and Penokok rivers (all, including the above, flowing into the Tampussuk), and a succession of ridges over sticky clay, padi fields, stretches of "Lalang," fringing woods and recent jungle, to the Dahobang, where the bridge,

a fine trunk of a tree with a hand-rail, was still intact. A dark vein of slate accompanied by another of grey mud was conspicuous in the bed of the river.

On the other side we passed into fine primary high forest, through which the path mounted steeply to the ridge, called Penibukan (about 5000′), which it followed for some time.

On this ridge a typical mossy forest association is found consisting of slender small trees crowded together. Here *Dacrydium falciforme* was general, also *Podocarpus brevifolius* and a small-leaved species, all in sterile condition. *Bambusa* (?) *Gibbsiæ* formed a dense growth scrambling through the slender trees, while the orchids and ferns collected were *Trichomanes rigidum*, the minute *Podochilus serpyllifolius*, *Appendicula congesta*, *Bulbophyllum Gibbsiæ*, *Microstylis kinabaluensis*, and *Spathoglottis gracilis*.

As the ridge dipped steeply to the Kinitaki river the mossy character of the forest ceased, and saturated clay carried a luxurious herbaceous undergrowth of the pink-flowered *Phyllagathis elliptica*, *Impatiens platyphylla*, *Pilea Stapfiana*, the white *Argostemma kinabaluense*, *Elatostema kinabaluense*, *E. penibukanensis*, *E. viridissimum*, *E. pedicellatum*, and *Lepidosperma chinense*.

Crossing the Kinitaki, quite a small stream at this level, we ascended again sharply, the track following the course of a small rivulet. The clay soil was here more exposed, and the undergrowth thin and scattered; *Phyllagathis elliptica*, *Sonerila tenuifolia*, with some plants of the *Impatiens*, still made pink the dominant note. As one mounted, the height of the trees fell markedly, shrubs of *Leptospermum recurvum* began to line the watercourse, with the drooping youth-form of *Dacrydium Gibbsiæ*, while *Aletris rigida* and *Eriocaulon Hookerianum* were dotted on its broadening clay banks. And then we suddenly emerged on an open space, the far-famed spur of St. John, Burbidge, and Haviland.

This space seems to be due to the head-waters of the small stream, which loses itself in a marshy open area that ascends in shallow terraces of yellow clay to the forest above. Although in describing its character allowance must be made for the fact that the observations were made in persistent rain, most of the plants collected in this association actually point to permanent moisture. The fine pink *Melastoma decemfidum* was in full flower associated with the rigid, but for the genus handsome, large-leaved *Styphelia malayica*, the stiff little shrub *Hedyotis protrusa*, with erect branches, and the spreading herbaceous *H. pulchella* var. *magnistipula*, *Diplycosia kinabaluensis*, with green flowers and dwarf creeping habit, *Dianella ensifolia*, *Isachne virgata*, *Carex cruciata*, *Schœnus melanostachys*, and the smaller herbaceous plants *Eriocaulon Hookerianum*, *Aletris rigida*, the handsome *Lophoschœnus Urvilleanus*, the red rosettes of *Drosera spathulata*, and *Schizæa malaccana*. *Nepenthes*

tentaculata, with the habit of *N. gracilis*, but the whole plant purplish in colour, was plentiful. Of the magnificent *N. Rajah*, however, described by St. John (**7.** 324) and Burbidge (**9.** 108) as abundant in this spot, not one specimen was seen.

Exposed yellow rock, the same colour as the clay, so rotten that it crumbled in one's hand, cropped out towards the top of the marshy ground, where our camp was pitched. Beyond this rock, which was dotted with *Leptospermum recurvum*, covered with its snowy blossom, the open space broadened still further until it opened out into an upper, more or less flat, soaked area of hummocky ground, carrying only a surface vegetation.

The open lower terraced area was bordered by a dense scrub association of small trees, about 5–7 m. high, in which the mature form of *Dacrydium Gibbsiæ* was conspicuous with its erect candelabra-like branches, suggesting some species of *Araucaria* in habit, as previously described by Low (**2.** 14, 'Amacaria'); also *Podocarpus brevifolius*, whose dense dark green foliage contrasted in colour with the bright red of its young shoots, *Scævola pedunculata* var. *mollis*, collected by Haviland and recently described from Palawan by Merrill, *Leptospermum recurvum*, a form of *L. javanicum* and the handsome *Helicia Maxwelliana*, fastigiate in habit, with sweet-scented, white, cauline flowers.

The rain continued steadily all night, but at about 7 A.M. next morning it ceased a little and the clouds rose, disclosing a partial view. They soon closed in again, however, and it seemed hopeless to spend any more time up there. Instructions were, therefore, given to the Dusuns to pack up everything, and my boy returned with them to Kiau in charge of specimens, while three or four coolies and the invaluable Lamat remained with us, as we were anxious to exceed St. John's and Low's record of 6200′ on this spur.

First crossing the soaked area covered with small plants of *Nepenthes tentaculata*, showing only little groups of radical pitchers of the characteristic purplish colour, we came to the forest fringe, where many dead pitchers of *N. Lowii* lay on the ground. I could not see the plant, but found one of *N. Boschiana*, an epiphyte with handsome green pitchers with browned splashings; then through a fringe of *Helicia Maxwelliana* we passed into a mossy forest, which clothed the steep slopes to the granite core.

The moss grew thickly on the ground and up the branches of the trees, which were a beautiful sight, literally garlanded with *Nepenthes Edwardsiana*, the vines passing from tree to tree, with the wonderfully coloured large bright red pitchers, shading to green at the base, hanging vertically in profusion from them. *Bambusa* (?) *Gibbsiæ* was associated with it in profusion, also *Gleichenia vulcanica*.

Of the trees, *Ardisia brachythyrsa*, *Urophyllum lineatum*, *Dacrydium*

falciforme, *Podocarpus imbricata*, and the small-leaved species seen on Penibukan ridge seemed to predominate, along with *Phyllocladus hypsophylla*, the delightful yellowish-white *Drimys piperita* and the pink *Sterculia translucens*, whose pretty fallen corollas starred the ground.

Climbing on over trunks and roots, we reached a more open space on the spur, with very fine trees of *Podocarpus imbricatus*, with hanging cypress-like branches, *P. brevifolius* and *Phyllocladus hypsophylla*, and I thought I saw the weeping dark green branches of *Dacrydium elatum* in the distance, but there was too much rain and mist to be certain. *Rhododendron cuneifolium*, with small salmon-red flowers, occurred here as an undershrub; and a tree overhanging the Kinitaki valley, with the glorious yellow *Rhododendron Brookeanum* and the smaller, exquisitely rose-red *R. crassifolium* in full flower on its branches, was a beautiful sight. The position of the Rhododendrons was perilous, but Lamat proved equal to the occasion and brought me specimens of both species.

Above this point the trees began to get smaller, and *Trichomanes maximum*, abundant up to this level, was replaced by a zone of the dark plumy fronds of *Monachosorum subdigitatum*; then still higher there were *Diacalpe aspidioides*, *Dryopteris stipellata*, with a creeping *Selaginella* brownish-yellow in colour, and here and there the yellow *Spathoglottis gracilis*.

Phyllagathis elliptica, *Hedyotis pulchella* var. *magnistipula*, and a *Begonia* were scattered in the mossy substratum up to 8000′, with both *Balanophora Lowii* and the brilliant red *B. elongata* in typical clumps at the base of trees. The erect fronds of *Selaginella Willdenowii* associated with the *Monachosorum* to 8000′.

Among the epiphytes the orchids *Dendrochilum kinabaluense* and *D. Gibbsiæ*, *Eria villosissima*, *Chelonistele lurida*, and the ferns *Lindsaya Jamesonioides*, *L. pectinata* and *L. decomposita* were noted, and the familiar little hairy tufts with flaccid fronds of *Polypodium hirtellum* were collected on the moss-grown trunks.

At 8000′ the moss grew, if anything, thicker, but most of the undergrowth with the Selaginellas and Begonias still persisted. It was unfortunately impossible to continue farther as there was the return journey to Kiau to take into consideration; so we descended rapidly, the slippery moss entailing horizontal rather than vertical progress. At the now deserted and dismantled "zulap," Mr. Maxwell's boy, with the policeman, was in waiting with a very welcome lunch. Thence the return to Kiau was accomplished over the slithering clay switchbacks in ceaseless rain.

d. Ascent to the Summit.

The weather now showed signs of breaking, and Lamat reported the Kadamaian as passable in two days. They proved very busy ones. My time

was fully taken up by labelling and writing up the plants already collected, and arranging for work in all weathers on the mountain itself, while Mr. Maxwell organised the details of the expedition, no light task in such a country. Bearers had to be chosen among the many volunteers, sufficient rice procured for the needs of so many people—the Dusuns growing little more than suffices for their own consumption—and the necessary quantity once obtained had still to be husked. Dried fish ordered from the coast had not yet arrived; so the natives had to make the best of their own small supplies, while the country was scoured for chickens both for sacrificial requirements and our own needs. "Kajangs," tents, blankets, and stores had to be sorted and packed, and the endless necessary arrangements made for so large a party on a five or six days' trip. Everything was finally settled, even to the religious observances ,which, I was most interested to hear from Mr. Maxwell—who seemed to combine exemplary patience with the happy knack of pleasing everybody, yet set on getting things through to his own satisfaction—were still considered as vital to the success of an ascent as on previous occasions. We both felt very strongly that the same respect which had ensured satisfactory results before should be shown in the present case, and the final arrangements were to the effect that the three head-men, Sumpat, Lamat, and Umpoh, should act as guides, only carry their own loads and be in charge of all the essential ceremonies. Finally, on the 22nd February, the third morning since our return from the Maraiparai, we started in magnificent weather, a party of 35, for the summit, Lobang rock being the first stage in the ascent.

Old Sumpat carried an enormous basket of charms, something like a pillow-lace cushion in shape, the charms hanging all round like bobbins, each encased in coloured rotan, beautifully plaited. The separate items consisted of bits of horn, bone, pebbles, glass, and other oddments, and I recognised the basket as the same which Low (**2.** 9) described as being carried by his guide Lemaing on the occasion of his first ascent, and St. John (**7.** 268) on that of the second.

The path skirted the slopes to the east, keeping to the Kiau level, dipping up and down as we crossed the many streams with their fringing woods, which intersected the slopes. The latter were all under cultivation, the summer "houses" of the Kiaus dotted about them, and often whole families working on their allotments, on which the sun beat down with relentless force. Farther on, the fields had evidently been abandoned for the last year or so, as they were covered with a fine crop of "Lalang," and the "houses" showed signs of decay. The opposite slopes of the valley, which Burbidge (**9.** 95) noted as under cultivation, were clothed in recent secondary woods; while, looking over to the Kolupis valley, where Whitehead (= Kinokok, **16.** 180) camped for some time and which he describes as clothed in primary forest, one saw the whole of the lower slopes covered with young jungle in

the ombrophobous stage, with the abandoned padi houses above them—proof that this area had evidently been worked since his time. I conclude, therefore, that the forest is cleared in a definite rotation in appreciable communal areas on a well-considered plan, regulated by the needs of the community.

This view is held by Whitehead (**16.** 112), who confirms the definite ownership of land and the appreciation of its economic possibilities under varying conditions, mentioning, in a specific case, the value of old rice-land that had returned to forest during the minority of an heiress, when the rotans had not been cut for seven years.

The primary forest begins at about 3500′, where the party halted for the Dusuns to cut water-vessels at a fine clump of bamboo, the last met with on the ascent. Entering the welcome shade of the high forest, the beautiful spaced trees showed a substage of younger ones, with herbaceous undergrowth averaging in parts a quarter to over a metre in height.

Of the trees, *Goniothalamus roseus*, judging from the number of fallen pink corollas, was one of the finest and commonest, whilst *Laportea stimulans*, *Tarenna Gibbsiæ*, and the pink-flowered *Ardisia oxyphylla*, the latter as an undershrub, were equally frequent.

The undergrowth varied from areas covered with the *Arum*-like foliage of *Arisæma simplicifolia*, about a third of a metre high, the quaint spathes green splashed with red, and green and white at the throat, to others with *Ophiopogon malayanus* and *Schismatoglottis caulescens*, the latter with a pretty little white spathe and yellow spadix. Farther on, after crossing a stream, this undergrowth increased in height, averaging 1 metre, and mainly made up of the white-flowered *Argostemma hameliæfolium*, the graceful recurved fronds of *Elatostema thalictroides*, the familiar pink *Impatiens platyphylla* and *Hedyotis pulchella*. I also saw one beautiful group of an acaulescent palm, unfortunately sterile, the large fronds with interrupted pinnæ being 3–4 metres long. The bed of the Kadamaian proved disappointing, as the huge boulders and rocky sides sheltered very little growth, no doubt owing to the terrific force of the torrent. But the absence of conspicuous bryophytic growth, both by the water and under the trees, was as striking as that of epiphytic foliaceous lichens.

On leaving the Kadamaian, the invisible track we followed passed, still rising, over a ridge to the Lobang torrent, where the herbaceous undergrowth, chiefly urticaceous in character (*Elatostema rubro-stipulatum* being common), was not at all thick. On following the Lobang, several enormous squarish blocks, like erratic boulders, were passed. Finally working up the bed of this torrent, which fell over a smooth greenish rock, apparently serpentine, we reached the well-known Lobang rock, another cyclopean block, the inclined face of which, blackened in parts by many camp-fires, showed the remains of a pudding-stone vein, with rounded pebbles embedded in a cement which almost suggested some human agency. This vein of conglomerate would explain

the occurrence of the other similar blocks, the soft pudding-stone having worn away and so caused the breaking up of the material it bound together. At the base of Lobang rock grew *Desmodium Scalpe* and *Adiantum hispidulum* with *Reboulia hemisphærica* var. *javanica*. Fine trees of *Goniothalamus roseus* and *Tarenna Gibbsiæ* sheltered in the immediate vicinity of the rock a dense upgrowth of young plants of the former species, flowering at 3 metres, with *Psychotria malayana*, a *Cyrtandra*, and *Calanthe kinabaluensis* as common undergrowth.

In the bed of the stream and spreading up the banks, *Sambucus javanica* was in flower, also *Polygonum chinense*, *Cyrtandra Burbidgei* with stiff unbranched stems, about 1 metre high, and most peculiar large white bracts all up the stem, veiling the inconspicuous flowers, and the white-flowered *Pratia borneensis*, a herb of shrubby habit.

Crossing the stream, one mounts on the other side up steep shingle slopes, with little undergrowth beyond sticky shrubs and a few plants of *Adenostemma viscosum*, *Blumea balsamifera* and *Mikania scandens*. The shingle slopes end sharply under a series of rock-ledges, to which they no doubt owe their origin. These ledges form the shoulder of the ridge of the south-western spur, which is followed in the ascent to the granite core. Still in high forest, they were partly veiled thickly by interlaced moss-covered roots of trees and, in the steepest parts, overhanging branches, while other areas were covered with the most luxuriant vegetation so far seen.

The trees found here were the green-flowered *Urophyllum nigricans*, *Blastus Cogniauxii* with inconspicuous white flowers, and *Ardisia amabilis*, also white, then *Sterculia translucens* and *Drimys piperita*, as abundant here as on the Gurulau and Maraiparai spurs, and fine examples of *Podocarpus imbricatus*, *P. brevifolius*, and *Phyllocladus hypsophylla*. Among the undershrubs, the magnificent *Rhododendron Lowii*, with a rounded top, covered with huge bunches of splendid yellow flowers of a fleshy texture, grew out conspicuously from the ridges, whilst *R. Maxwellii*, also yellow-flowered, occurred in this association along with the slender overhanging *Rubus fraxinifolius*. The luxuriant undergrowth of these favoured slopes and ridges seems entirely herbaceous in character. The handsome *Begonia Burbidgei*, averaging 2 metres in height, a mass of large pink flowers, was growing thickly with *Strobilanthes kinabaluensis* and *S. Galeopsis*, the latter contrasting with white flowers and reddish leaves, and *Pratia borneensis* and *Hedyotis pulchella*, a herb of similar stature, were equally abundant. *Impatiens platyphylla*, *Elatostema thalictroides*, *Rhuacophila javanica* and *Ophiopogon malayanus*, all of smaller growth, formed a substage, under which again *Chlorophytum brachystachyum*, *Elatostema rubro-stipulatum* and *E. penibukanensis*, the pink *Sonerila pulchella* and *Oplismenus compositus* occurred associated with orchids.

Nertera depressa and *Peperomia decumbens* covered old tree-stumps, and

Lycopodium Hippuris hung suspended from others together with *Piper amphibracteum*, with the orchids *Saccolabium kinabaluense*, *Phreatia densiflora* and *Eria pilosissima*.

Once over the last ridge, with sudden transition one passes into a fine mossy forest, at about 6000′, very sterile in character, spreading evenly over the top of the sheltered shoulder. Fine trees of the conifers just quoted seem to predominate, and young trees of the *Phyllocladus* were very general as a substage, flowering and fruiting at 5 metres. The stems of the older trees were all swathed in moss, as were rotting logs covering the ground.

Undergrowth was markedly absent; now and again the slender shoots of *Rhododendron stenophyllum* were seen with very long narrow leaves in scanty whorls up the stems and crowned with one or two flowers bright scarlet in colour and of fleshy consistency, or sparse plants of *R. cuneifolium* and *R. ericoides*, the latter one of the most general and characteristic of the plants peculiar to this mountain, with its heath-like foliage and little red flowers. The grey-looking *Trichomanes pallidum* and the fennel-like *T. Bauerianum* with *Polypodium hirtellum* were scattered over the moss-clothed stems and logs, the latter sheltering between them clumps of *Dawsonia altissima* and *Sphagnum gedeanum*.

Again without transition, we suddenly emerged on to an open ridge at about 7000′, narrow, but with vegetation, springing thickly from either side and composed of dwarfed *Dacrydium Gibbsiæ*, *Podocarpus imbricatus* and *P. brevifolius*, and the *Phyllocladus*, with dense crowns about 3 m. high. I saw the first vines of *Nepenthes Lowii* stretched across their stunted stems, with their graceful urn-like green pitchers, and with it *N. Edwardsiana*, all the pitchers hanging vertically and full of water; radical pitchers were searched for, but not found. The narrow track showed fine white sand, and looked as if it were kept open, possibly by deer. On both sides *Gleichenia vulcanica* twined its long fronds and *Cheiropleura bicuspis*, *Polypodium triquetrum* and *Plagiogyria adnata* were abundant—all xerophytic types.

The ridge soon opens out on to the little oasis of Kamburangau, "the spirit place," in the Dusun tongue, and the "Temburengo" of previous records, famous as the only locality for *Patersonia* outside extra-tropical Australia. It was on this spot that Whitehead, under almost impossible hardships, spent six weeks in practically ceaseless rain and mist, and, although ill with fever and limited to a miserable zulap as shelter for himself and his faithful Kadyans, obtained and skinned a great part of his priceless collection of birds.

When I arrived the coolies were all busy cutting firewood, whilst a fine zulap, roofed with "Kajangs," had been erected under Mr. Maxwell's able direction. He told me that the supports of Walterstadt's zulap were still standing when they arrived.

As it was raining again I quickly worked through the open patch of

sedge-like growth, which is simply a shallow sand-pan about 10 metres square, and not marshy at all as previously described.

Round the edge were a few dead trees wreathed in some melancholy looking *Lycopodium casuarinoides*, the only approach to anything like a *Casuarina* seen anywhere, though previous writers all record this unmistakable genus both here and on the Maraiparai. *Patersonia borneensis*, with little mauve iris-like flowers, is dominant, while *Carex hypsophila*, *Dianella nemorosa*, the brown-spiked *Gahnia javanica*, completed a typical psammophilous association, through which the hirsute form of *Didiscus saniculæfolius* sent its runner-like stolons, with the aerial shoots drawn up to the level of the *Patersonia*, the moss *Campylopus exasperatus* spreading through the whole growth, proliferating four or five times. On the more open edge *Eriocaulon Hookerianum* and *Aletris rigida* occurred. Beyond this edge *Dipteris conjugata*, *Pteridium aquilinum* and *Gleichenia circinnata* var. *borneensis* formed a dense growth which spread under the surrounding trees, all about 5 metres high and consisting principally of the flat-topped *Leptospermum javanicum* and *L. recurvum*, *Embelia kinabaluensis*, *Styphelia Learmonthiana* and *S. suaveolens*, *Diplycosia ciliolata*, *Vaccinium buxifolium*, the conifers already enumerated for the ridge, and the chubby *Rhododendron ericoides*.

There was some difficulty about water here for so many people. The little that had soaked into holes made in the sand soon giving out, we had recourse to the pitcher-plants for our tea; but the rain very generously soon solved all difficulties.

From Kamburangau progress, fortunately for me, was very slow, as a path had to be cut all the way up, and, thanks to Mr. Maxwell's escort, I could devote all my energies to collecting, as he very kindly entirely superintended operations. The helplessness of natives at these altitudes has to be seen to be believed, the low temperature having a most demoralising effect. Clad in thin cotton garments, the coolies have no protection against what to them is an unknown sensation; they look upon it as a disease to which they would willingly succumb if no European were present to keep them going and consequently warm.

Beyond the exposed ridge one passed through another sheltered patch of mossy forest (Pl. 6. fig. 4), with slender straight trees, similar to that found on Penibukan. Here *Bambusa* (?) *Gibbsiæ* reappeared, fortunately in flower, also *Calamus Gibbsianus*, whose thorny flagellæ were an unmitigated nuisance in collecting, and still worse for the path-cutters. *Rhododendron Lowii* as an epiphyte and *R. stenophyllum* were quite frequent, as well as a palm, *Pinanga capitata*, also in flower and fruit, and the tree-ferns *Alsophila crinita* and *Cyathea dulitensis*, all about 2·5–3 metres in height. *Davallia contigua*, *Hymenophyllum blandum*, and the pretty pink *Sonerila crassiuscula* formed some of the undergrowth together with *Begonia Burbidgei*, here much

reduced in stature, whilst amongst the very luxuriant epiphytic growth *Eria ferox*, 0·75 metre in height, was in flower.

As this formation opened out a little we came upon the first plants of *Nepenthes villosa*, erect, just over one metre in height, both in flower and fruit, with the beautiful pitchers radiating round the plant and embedded in the moss up to the middle, the petioles of the upper leaves lengthened accordingly. I did not come across the giant of all, *N. Rajah*, named by Sir Hugh Low in honour of the Rajah Brooke of Sarawak, and spoken of previously as very abundant, nor did I observe any plants of *N. villosa* approximating in size to those described by Burbidge, nor was this species seen in anything like the same quantity as the observations of previous observers would lead one to expect.

When we left the sheltered mossy forest and emerged on the open ridge at 8000′, the same yellow clay and rotten yellow rock was exposed as previously seen on the Maraiparai. Specimens of both having been submitted to Dr. Cullis, of the Royal School of Mines, he found that they were identical in composition, representing disintegrated serpentine, the green olivine matrix being still intact. He hazards the following possible explanation of the presence of this formation :—"The occurrence of serpentine on the spurs of the mountain at some distance from the summit on more than one point, viz., on the Maraiparai at 5000′, and on the south-western spur at 8000–11,500′, suggests that possibly the massif as a whole may be a differentiated plutonic complex with basic rocks (peridotite) around its margin, and acid rocks (granites) in its centre."

On the ridge the vegetation was open, consisting of a tangled shrubby growth of quite a southern-hemisphere facies. Here *Diplycosia ciliolata*, *D. cinnamomifolia* with its waxy pink bells, *Vaccinium coriaceum*, *Rhododendron ericoides*, *Daphniphyllum borneense*, *Ilex revoluta*, stiffly erect, with white flowers and very recurved leaves, and the ubiquitous *Hedyotis pulchella* rose to 1–2 metres in height, the most striking plant being *Vaccinium cordifolium*, whose long wand-like branches terminating with a row of lovely pink- or white-waxy bells, 2–3 cm. long, swept along the ground or over it, or through the bushes, quite wanting in the usual rigidity of the genus and conspicuous by its young reddish tomentose foliage. *Diplycosia kinabaluensis* appeared again, spreading on the ground where the shrubby growth was not so dense, along with *Polypodium triquetrum*, *Polystichum aristatum*, and *Dipteris conjugata*, whilst all the way up clumps of *Rhododendron rugosum*, 2–3 metres high and smothered with mauve-pink blossom, were a lovely sight. *Nepenthes tentaculata* with *Gleichenia circinnata* var. *borneensis*, *G. vestita*, and *Lycopodium casuarinoides* trailed over and through everything.

Farther on, where the ridge was broader, *Dacrydium*, *Podocarpus* and *Phyllocladus* reappeared as small spaced trees with mossy covered stems,

whilst *Leptospermum javanicum* and *L. recurvum* showed a flat-topped Japanese effect as one looked down on to the lower ridges. Between these trees, where the yellow crumbling serpentine rock was exposed, spaces opened out with the handsome *Euphrasia borneensis*, erect in the sun and prostrate in the shade, the charming little *Gentiana lycopodioides*, with its vivid dark green foliage and white flowers, spreading in the shade and tufted in the open, and the yellow *Platanthera Gibbsiæ*. *Elatostema bulbothrix* was prostrate in habit, while *Sigmatochilus kinabaluensis*, *Cœlogyne papillosa*, *C. exalata*, *Schœnus kinabaluensis*, *Scirpus pakapakensis*, *Polypodium incurvatum*, *Polystichum aristatum* and *Plagiogyria adnata* were distributed, together with *Trichomanes digitatum* in moss at the base of trees. In small pans where moisture had accumulated, *Aletris rigida*, *Eriocaulon Hookerianum*, *Didiscus saniculæfolius* var. *rupicola*, *Eria kinabaluensis* and *Sphagnum gedeanum* occurred.

Always ascending, the ridge narrowed again and the shrub association reasserted itself, with *Lycopodium scariosum* and *L. volubile*. Here one exposed serpentine peak was covered with a uniform growth of *Dawsonia brevifolia*, 0·25 m. in height, with brown leaves adpressed to the stem.

Another sheltered patch of mossy forest occurred below 9500′, exactly similar in facies and species to that described for 7500′. After this the spur again broadened out at about 9500′, and we entered a more sheltered type of low forest with trees close together and about 6–9 m. high. The soil underneath was devoid of humus and bore little undergrowth, except for a few sedges and orchids.

The area covered was almost flat and water evidently did not run off easily, as the surface showed many pans and depressions which would hold rain-water, and in one part there seemed to be standing water for some distance, which did not, however, modify the general facies.

Here I found *Symplocos zizyphoides* and the myrtle-scented *S. deflexa*, *Myrtus flavida*, *Polyosma Hookeri*, *P. bracteosum*, *Schima brevifolia*, *Stranvæsia integrifolia*, *Actinodaphne Foxworthyana* and *Quercus Havilandii*, all with the exception of the latter of a sclero-microphyllous type. Towards the middle were some huge sandstone blocks where the brilliant red of *Dichrotrichum asperifolium* was an unwonted sight on some trees. *Schœnus kinabaluensis*, *Scirpus pakapakensis*, *Carex hypsophila* and *C. saturata* were scattered on stems and about the bases of trees, whilst *Vincentia malesiaca* and the brown-flowered *Eria grandis*, both growing in large patches, made up the greater part of the undergrowth. The stems of the trees were all clothed in moss. Here I saw the delightful *Merula Seebohmii*, a brown blackbird with a black breast, first collected by Whitehead, but recorded by all previous visitors, so tame and inquisitive that it came up within half a metre, intent on investigation, without showing the slightest diffidence.

Passing up through this sheltered forest the path diverged suddenly to the

left and ran steeply over prostrate trunks of trees with ascending branches, just as Low described them in 1852 (**3.** 13), to the Kadamaian, which dashed past at a terrific pace. The Pakapaka cave, really a huge rock with an inclined face, was perched just above the edge of the torrent, and this rock, with a zulap, formed our camp.

It was a gorgeous afternoon. The sacred fowl cooking on the sacred hearth simply smoked the cave out, and the only other level place to be found for writing up notes and labelling plants was a rock in the middle of the torrent, where I worked on till six o'clock, when the sun went in. My thoughts often reverted to Haviland and the ten days spent by him, mostly in a soaking downpour, in this very spot. It looked lovely now. Plants of the heath rhododendron were growing between the rocks in the middle of the stream, where, looking up, one had a vision of the bare granite core framed by the trees which clothed the banks of the torrent, while, looking down, the eye rested on forest-clad slopes. Along the opposite bank, whence a path ran down to Kiau, the trees were higher, hanging over the water, among them several of *Schima brevifolia* covered with their white camellia-shaped flowers. By the rock were *Polyosma bracteosum* with pinkish brown and *Rhododendron acuminatum* with smallish red flowers, and the *Phyllocladus*, the latter shrubby in size, whilst *Loranthus sabaënsis* spread its yellow flowers on *Rhododendron ericoides.* Behind and beyond the rock *R. Lowii* was growing on its own roots to the height of the other trees, the yellow buds just breaking, together with *Polyosma Hookeri*, with dirty purple flowers, *Correa*-like in shape. After everything was finished and arranged in readiness for the ascent next morning, I made my way up the stream to where it formed two deep pools one above the other, the steep banks shaded with trees on either side, but though I worked over everything carefully only one moss, *Braunfelsia scariosa,* rewarded my efforts.

Next day we started a party of seventeen—only those who volunteered being taken, among them the three chiefs and the policemen—for the last stage of the ascent. Making our way towards the summit, we passed for some distance through sheltered low forest, the trees being perhaps somewhat smaller and denser ; *Vincentia malesiaca* and the ugly *Eria* with the sedges already enumerated formed the chief undergrowth, the two former growing each in large colonies as described before.

It was pleasant to emerge from the dank and airless sheltered forest into the brilliant sunshine and look over what resembled a dense plantation of small symmetrical trees, all of about the same level of 3–4 metres. The sun beat down on their flat tops, whose shape proved that the wind must sweep over them from all sides to an equal degree. These perfect little trees all apparently belong to the species already enumerated for the exposed serpentine ridge from Kamburangau. This observation is also confirmed

by Haviland's collection, as Dr. Stapf, in the table for his *summit zone* (from 10,500′ upwards, which would comprise this dwarf sub-summit forest), only quotes *Eugenia ampullaria*, *Embelia spirœoides*, and *Myrsine dasyphylla* as not found lower down.

Podocarpus imbricatus is here very erect, with radial foliage and no cupressoid biserial drooping shoots. *P. brevifolius* showed the same habit as on the Maraiparai, while *Phyllocladus hypsophylla* was in some cases so glaucous as to be conspicuous amongst the even level of the tree-tops, while in others only the youngest flowering whorl would show a glaucous bloom. *Dacrydium Gibbsiæ* was in flower and fruit, as were also the other conifers, both sexes being equally frequent. This was a fortunate occurrence in the case of the *Dacrydium*, of which so far only the youth-form had been collected, a condition which was insufficient for identification.

Perhaps the fact that these Taxaceæ were all so obvious that they could not be overlooked, accounts for their alleged predominance in this locality over angiosperm representatives, of which *Embelia kinabaluensis*, *Eurya reticulata*, *Ternstrœmia Lowii*, *Styphelia Learmonthiana*, *S. suaveolens*, *Diplycosia cinnamomifolia*, *Stranvæsia integrifolia*, *Vaccinium buxifolium*, and *Polyosma Hookeri* were in flower, while *Leptospermum javanicum*, *L. recurvum*, and *Schima brevifolia* were in the bud.

Open spaces were occupied by a scrubby growth of *Gaultheria borneensis*, about 1 m. high, *Vaccinium cordifolium*, *Hedyotis pulchella*, *H. macrostegia*, and *Phyllocrater Gibbsiæ*, distinct in its large single white flowers, but of similar habit, and the persistent little *Diplycosia kinabaluensis*, whose large leaves contrast so funnily with its dwarf stature among the predominating microphyllous facies of this formation. A *Rubus* was seen, but not in flower. Associated with these were *Gleichenia vestita*, *Polypodium alternidens*, *Plagiogyria adnata* and *Nepenthes tentaculata* var. *tomentosa*.

I caught up the main party waiting at a rock, and hearing the chiefs had retired for the necessary incantations, dived under the trees to investigate the undergrowth, but only found some *Loranthus sabaënsis* on the heath Rhododendron, growing near the ground. An unexpected and deafening report of a gun caused me to return in haste, when I learned that the praying was over. Six eggs had been deposited on the stone, and the shot was to warn the "Hantu" that a Tuan was intruding on their mystic solitudes.

e. **Summit (Granite Core).** 11,500–13,400′.

We then went on together and soon stepped out of the dwarf forest on to the granite core (Pl. **7.** fig. 6), which at its edge was swept by the branches of the trees composing the former. The granite at first spread out rather evenly, with a little light yellow orchid, *Dendrochilum stachyodes*, in the cracks

then rising steeply all round it was intersected in every direction by innumerable cracks, into which all the vegetation was crowded, the intervening granite surface being absolutely bare and water-worn.

This vegetation consisted of shrubs, which towards the base of the granite were about 1 metre in height. Here they receive the surface-water, and are to a certain extent sheltered by the dwarf forest, but as they become more exposed to wind and radiation effects they are gradually reduced in height to 0·25 m. or even less. They were still of the serpentine ridge and dwarf forest facies, and seemed to be its plastic survivals:—*Eurya reticulata*, *Leptospermum recurvum*, *Ilex revoluta*, *Styphelia suaveolens* and *S. Learmonthiana*, *Diplycosia kinabaluensis* and *Rhododendron ericoides*.

We mounted steeply to the right, and here Umpoh, the son of Kaboung, with a grace that would have done credit to a minuet, offered me his hand, and we ran up the steepest part in three laps; an excellent method of negotiating steep and slippery granite with a sure-footed companion, when not rubber-shod. It was a choking sensation for some time, but to observe that Umpoh was just as distressed gave some satisfaction.

Once over this, the worst part, we rose to the left, where the waters of the Kadamaian spread over the smooth granite wall, filling all the cracks and holes with water, covered with an appreciable film of ice, about 5 mm. thick. The Dusuns, exclaiming with wonder, sank on their knees, hastily filling their "siri" boxes with what to them must have seemed a miraculous substance. With true British regard to fact, they were duly warned of the consequences, but, I was glad to see, with no effect. If it disappeared as miraculously as it appeared, "their's not to reason why," the "Hantus" had but claimed their own.

This spot was unusually bright and gay with the yellow flowers and silvery foliage of *Potentilla leuconota*, another of the far-famed gems of the mountain flora, and with *P. Mooniana*, also in full flower, but dressed in sober green, both known from the Himalaya and also from New Guinea. With them the carpeting *Pilea Johniana* and *Haloragis micrantha* were associated; but though I worked over the rock very carefully nothing else was seen, except a small colony of *Centrolepis philippinensis* in little orbicular patches on the edge of a sheltered bay. These plants were purely chasmophytes, like all those on the granite core, and the fact of their branches spreading over the rock proves that the water is perpetually streaming here, otherwise they would be cut back to the edges of the cracks—as is elsewhere invariably the case—by the intense insolation and radiation from the granite, which immediately burns back lateral branches.

Above this wall the rock, through which the Kadamaian had cut a shallow channel, flattened out. The plants in the cracks were now reduced in height, though the prevailing species remained the same. Crossing Low's Gully

I saw no trace of the blood-red *Rhododendron*, which could not have been in flower without being noticed. Finally, over another granite wall, we struck the long inclined slope to the granite plateau of the actual summit, marked in the accompanying shaded map (Pl. 2) which Captain Learmonth has most kindly allowed me to reproduce, and in which he has embodied the very important results of his survey.

The following plants were limited entirely to the cracks and were clipped like little box-edges, more, as I have explained before, by insolation and radiation from the rock surface than by wind, which only accounts for the reduced height. The decumbent branches ran along the soil which filled the cracks, sending up little erect aerial shoots reduced to 0·25 m. in height. *Styphelia Learmonthiana* and *S. suaveolens* were both in flower, while *Leptospermum recurvum*, mostly still in bud, was very predominant, and I can well believe that it clothes the summit like a fall of snow, when out, as described by Low (2. 13) in March.

Rhododendron ericoides was in flower and also very plentiful, with the tips of its acicular leaves converted into callous white points, while *Eurya reticulata*, in fruit only, showed a conspicuous callous white border round the leathery leaves ; *Diplycosia kinabaluensis* was not modified in size or habit. The sight of *Drapetes ericoides*, in typical ericoid tufts about 1 dm. high, covered with minute white heads of flowers, and of *Haloragis micrantha*, forcibly recalled New Zealand mountain conditions, which were accentuated still more by *Centrolepis philippinensis* and a little *Erigeron*-like composite, unfortunately only in bud and therefore indeterminable, but which Mr. Moore considers to be a *Lagenophora*. Knowing this would be an interesting record, I hunted all along the cracks for another specimen, but only found one more plant in the same condition. Other herbaceous plants were *Didiscus saniculæfolius* var. *rupicola, Phyllocrater Gibbsiæ*, now prostrate, the two Potentillas, previously cited, in rosettes with no stolons, and the minute *P. parvula. Gentiana lycopodioides* grew in erect tufts, as well as *Euphrasia borneensis*, while *Haloragis micrantha* and *Pilea Johniana* were both abundant, spreading under and round the other plants, but all again strictly limited to the soil-surface of the cracks. *Scirpus Clarkei* was very distinct, extending for some distance by itself ; *Schœnus kinabaluensis, Carex hypsophila, C. rara, Deschampsia flexuosa* var. *rigida*, and *Poa epileuca*, the latter as abundant as the *Scirpus*, competed for the little available space, making up the tale of the ghostly buffalo grasses, on which the phantom herds of the spirit dwellers browse. I was surprised to come across several plants of *Blechnum capense*, another new record for the summit. In passing up this incline, a soft rock with white crystals spreading over the surface of the granite, and so rotten that a piece broke off easily, is referred to by Dr. Cullis as a lava biotite-augite andesite. Farther on, under the lee of

a row of granite blocks, the crack association ran up to 0·50 metre in height and included a lot of male plants of *Coprosma Hookeri*, of typical habit, but no female plant. Here were also some other shrubs, probably *Symplocos buxifolia*, which with *Rubus Lowii* and *Schœnus apogon* were the only recorded plants for the summit which I did not find in flower.

Suddenly finding myself alone, deserted by the shivering Dusuns, who hardly knew where to shelter themselves from the bitter wind on the summit, I walked quickly on in the only possible direction to be taken, to break with dramatic abruptness on to the splendid granite plateau of the actual summit, which with a slope to the N.W. stretches for a mile in front. Huge peaks, almost all of the same height, align themselves on its surface like the columns of some roofless titanic temple, recalling the dissected plateaus of Skye, a similarity no doubt due to the even altitude of the peaks. The flat appearance of some of them suggested that their tops mark the original level of the whole plateau, the peaks, apparently of a harder rock, remaining while the granite of the plateau had worn away. They certainly could not be described as tors, as there were no planes of bedding or of cleavage. The granite of the plateau in the narrowest portion shown in the map is now weathering in huge slabs, which slide down the inclined surface and pile up towards the base of the slope (Pl. **7**. fig. 6). Erosion under these conditions must be very rapid. The peaks showed every stage of disintegration from an unbroken wall to the perpendicular, flat-topped shape of St. John's Rock; while in the case of smaller ones, the tops had worn off altogether, and Low's peak was reduced to a heap of stones like a cairn, which being apparently the highest and the easiest, I decided to ascend for the view. Making towards it, I saw that it was connected with a smaller peak by a wall of rectangular cyclopean blocks, the latter very similar in appearance to some of the magnificent dykes exposed in the granite of the Rhodesian Matoppo Hills. This cyclopean wall marks the limit of the plateau, lying as it does on the brink of a stupendous abyss. The cold wind was whistling through the gap formed between the two peaks, the thermometer registering 50° F., approximately the same as in previous records. Half up the cairn I found a female plant of *Coprosma Hookeri*, about 1·50 m. high, sheltered between the blocks of granite and the remains of a vein of hæmatite, a detached portion of which still adheres to a piece of granite (altered granite). Dr. Cullis gives the following tentative explanation of the occurrence of this vein:—"Hæmatite veins probably formed by downward percolation of ferruginous water from the overlying formation, since removed by erosion."

On the summit the view was magnificent, but I had lost the best of it, as the clouds already rolling up now obscured the whole of the N.E. coast. It was disappointing not to be able to see the bottom of the mighty abyss,

but the angle of the peak was too great, and it did not seem advisable to move about much on the loose stones. On being joined by the advance party, which had explored the farther end of the plateau, reported as absolutely devoid of any vegetation, a point since confirmed by Captain Learmonth, we wrote down our names with those of the policeman and the Kiau Dusuns, deposited them in a bottle and, with befitting dignity, built a small cairn of stones over it; this ceremony being evidently looked upon as our share of solemnities of the occasion.

On this peak Low and St. John had left, the former a bottle, and the latter a tin, which were both brought down by Little's guide Limbawan, Little himself not leaving the plateau, and it was not until his return to Kiau that he learnt of the abstraction of the bottle or tin. He gives the sum of their contents, but unfortunately does not mention the fate of the interesting relics (**15**. 157).

Once back on the plateau, I tried to get down over the edge of the abyss, but the Dusuns brought me back each time, on the score of loose stones. Little (**15**. 156) had the same experience, and I can thoroughly endorse his remark that it would be beyond mortal power to dislodge one of those blocks. I desisted, however, as he had done, thinking that they had some religious prejudice on the subject. Captain Learmonth, during his stay on the summit with Lieutenant Harvey, associated with him in the Survey, went down with him a certain distance without any difficulty, but the natives absolutely refused to accompany them, and the mist and rain being very persistent, they thought it wiser to desist. I was interested to hear that no plants were observed there on any of the peaks, all of which were ascended for the purpose of the Survey. The entire absence of all so-called rock plants is the most peculiar botanical feature of the granite core, and is entirely due to the nature of the rock. On the plateau of the actual summit, cracks, so conspicuous a few hundred yards farther down, are hardly present. In a few very small ones *Deschampsia flexuosa* and *Poa epileuca* were growing, and in one of Dr. Foxworthy's photographs a few plants of *Coprosma Hookeri* are shown (Pl. **7**. fig. 6); otherwise nothing breaks the majestic sweep of the rapidly disintegrating granite, where erosion is too rapid for the establishment of any permanent botanical factors. I saw no lichens or mosses on the rain- and wind-swept rock, the smooth surface of which prevents the formation of crannies or ledges, and opposes the consequent accumulation of detritus. A few shallow depressions held water, and algæ form a brown deposit on the surface of the rock, of which I took a scraping, resulting in 10 species.

In considering the summit vegetation of the granite core, we may suppose that the granite erupted into the old red sandstone, which still persists on the lower spurs and the coast ranges. The vegetation of that formation is

probably now unknown to us. Owing to the friable nature of the material, its erosion must have been very rapid on the mountain, and at the present time, where the formation is still present in the coast ranges up to Koung, it carries a growth entirely secondary in character.

Some remains of this sandstone, where protected by a well-established vegetative growth, may possibly still be present on the higher parts of Kinabalu.

At Kamburangau white sand is exposed, and the mossy forest which occurs on each side of this exposure is possibly due to its presence. Spencer St. John, in describing the buttress of the Maraiparai spur, mentions that sandstone abuts on the granite, and "that it appears as if the molten granite had been forced up through the sandstone" (**7.** 319). In that case sandstone would again coincide with the mossy forest.

In the centre of the sheltered small forest above and below Pakapaka were huge red sandstone blocks, and it was here that Burbidge probably camped on his second ascent, as he speaks of carving his initials on the soft red sandstone wall of the cave (**9.** 283). In this area the vegetation is that of the scrub association of the open serpentine ridge, which, however, is considered by Dr. Stapf (**17.** 115), on the strength of its extraordinary endemism, to be the original plant-covering of the old red sandstone.

Under the sandstone, accepting Dr. Cullis's tentative hypothesis which harmonises well with the botanical inferences, would succeed the basic peridotite, and the resultant serpentine of the open ridges and the cracks of the granite core where it persisted as the latter became more and more exposed. This serpentine carries everywhere the same scrub association, but with this difference, that, on the summit it is reduced to its hardiest and most plastic elements, which exposed there to very uniform conditions have assumed an equally uniform mode of growth. Thus the summit vegetation as we find it to-day would appear to be only a definite modification of the general scrub association of the serpentine formation of the mountain. The process of denudation is still continuing, and the dwarf sub-summit forest will possibly in time recede still farther. That the action of the eroding agencies has to a great extent been retarded, is due to the presence of that forest. Burbidge (**9.** 279), in working over what must be the present dwarf forest area, speaks of "patches an acre or two in extent without any tree-growth, bearing only a coarse sedge-like association, with giant plants of *Nepenthes Rajah*"; and Whitehead also (**16.** 170) describes the "slopes as nearly bare of shrubs." These spaces we did not observe, and possibly, if not overlooked, they have since been overgrown with shrubs and small trees.

With regard to the foreign elements on the summit, I conclude that they probably represent an "opportunity" association. Captain Learmonth informs me that "the prevailing winds assimilate to the monsoons in the

S. China sea, but in this case (B. N. Borneo) their direction follows that of the coast-line, and generally speaking the wind is from the N.E., November–April, and from the S.W., May–October." The former period covers the autumn fruiting-season in Australia and the S. Pacific. On the higher parts of Kinabalu a southern type of vegetation no doubt predominates, and though we cannot estimate the stages in which it may have reached the mountain, such a constant factor as seasonal winds is a matter for consideration in relation to the occurrence of heterogeneous elements in isolated situations.

Of summit-plants not known from lower altitudes on the mountain itself, the Australian elements *Drapetes ericoides* and *Lagenophora* occur in New Guinea at 8000–10,000′, *Didiscus saniculæfolius* is common to New Guinea and the Philippines, and *Centrolepis philippinensis* is so far known from the latter only, while *Haloragis micrantha* spreads from New Zealand to the Himalaya. The three Potentillas are a northern hemisphere element occurring in the Himalaya and the mountains of New Guinea; *Deschampsia flexuosa* and *Agrostis canina* are temperate cosmopolitan types, whilst *Blechnum capense* is widely spread in the tropics and subtropics.

The only endemic species limited to the extreme summit are, so far as we know at present, *Pilea Johniana*, *Symplocos buxifolia* and *Coprosma Hookeri*.

Should the incidence of mossy forest on Kinabalu be found limited to the sandstone, then the question of the development of this peculiar botanical formation, which previous observations in Fiji had already led me to suppose must be edaphic in character, would be easy to explain. In the sandstone some form of "ortstein" or pan may possibly have formed at a certain depth, which by impeding the free passage of water would bring about acid conditions of the surface-soil, inhibiting the action of animals and fungi, and consequently all metamorphic processes. An invasion of moss-growth would result, which by absorbing and holding water would act like a sponge, checking surface aeration, analogous to the development of humus in northern beech-forests, as demonstrated by Müller (Studien über die natürlichen Humus-Formen und deren Einwirkung auf Vegetations-Böden, Berlin, 1887). On the strength of this hypothesis, the mossy forest must be secondary in character.

In my own limited experience I have never come across any fungoid growth in this formation, and I should imagine that earthworms were also out of the question. Epiphytes and undergrowth are generally limited, producing an impression of sterility, but occasionally both may be more pronounced, as is the case in the association above Kamburangau (Pl. 6. fig. 4). The older the formation, the more prostrate logs encumber the ground. Sometimes the trees may be dwarfed, but as a rule the forest consists of a thick growth of slender unbranched trees, as described from

the Penibukan ridge and from places on the south-western spur; above Kamburangau the trees may be of an appreciable size, as on the Maraiparai, and where the mossy forest succeeds the high forest above the Lobang ledges. This type of forest also seems to be limited to very sheltered positions, where the tops of the trees form a dense covering and the circulation of the air and the consequent evaporation is practically nil.

f. Plant Formations and Associations of Kinabalu.

Dr. Stapf, following Junghuhn, has divided this mountain into zones of vegetation; but the Javanese conditions are so dissimilar to those obtaining in N. Borneo that I hardly think any comparison on an ecological basis will hold good, though from a systematic point of view the secondary and primary forests in the two regions are practically composed of identical species or showing very close affinity.

Java has been under scientific European control for over a century. It has ranges of mountains running up to 5000–6000′, culminating in more or less rounded peaks of greater altitude, and recent isolated volcanoes. As in India, expert forest control is very strict and all the ridges are left in virgin forest above 4000′. Below this altitude the whole land is under cultivation, controlled in the best interests of the land and of the people by expert agriculturists. Under these conditions one can well understand that a division of the country into plant-zones is a correct expression of the features of the plant-covering of the island. This remark would also apply to the mountain peaks, as on these, owing to their isolated and more or less symmetrical form, all sides would be exposed to equal insolation, precipitation, evaporation, and wind-incidence, combined with the certain factor of a daily periodicity of rain.

In N. Borneo none of these conditions obtain. The daily periodicity of rain is not the constant factor that it is in W. Java. During my stay at Tenom there was very little rain at all, and that which did fall was not to be reckoned on, at any definite time of day. On five days spent on Kinabalu itself rain only fell on one afternoon and night, and the mountain was clear for days after, in fact till I left the country in the beginning of March. The primary forest is also anything but a constant feature so far as altitude is concerned, and also very limited in its general incidence. The whole country is covered up to 2000–4000′ with secondary forest, subject to the influence of a more or less defined sequence of cultivation through a series of years, according to the needs of a fluctuating and sometimes very small population, as, for example, in the Murut country. This secondary forest comprises Stapf's "*hill zone*" from sea-level up to 3000′, but it may run up to a much higher altitude.

Stapf divides his botanical formations into

1. The zone of the plains and low hills, or the *hill zone,* from the littoral zone which skirts the coast as a belt of varying breadth up to 3000′.
2. The *lower mountain zone*, from 3000–6000′.
3. The *upper mountain zone*, from 6000–10,500′.
4. The *summit zone*, from 10,500–13,400′.

On Kinabalu zonal conditions are considerably modified. The general level of the surrounding hills, which have no orographical connection with the mountain and its spurs, is 3000–4000′. The mountain itself consists of a main buttress, forming a plateau about one mile in length on the summit, and a subsidiary buttress running at right angles to the latter for about four miles. Both these portions rise to the towering height of 13,400′ and 10,000′ respectively. This divergence militates strikingly against any uniform conditions which would lead to a zonal distribution of botanical formations, and a division on these lines consequently breaks down in actual practice. The only possible course seems to be to limit the formations themselves, as I have attempted to do, so far as possible in this paper. We would thus get

1. *The secondary forest*, from 2500–4000′. (Stapf's *hill zone.*)

Subject to fluctuations in cultivation, according to the incidence of the population and the needs of the inhabitants. The upper limit of this formation on Kinabalu at present is about 3500′, but I saw evidence of its having reached up to 4000′ in recent times. Low, in 1852 (**2**. 8), mentions clearings up to 1000′ below the summit of Nokok (Saduk Saduk), 6000′ in height, and St. John in 1858 says that one side of this mountain was cleared to its summit for rice production (**7**. 330). The population was then very much denser than it is now after the ravages of small-pox and cholera epidemics.

2. *The primary high forest.*

From 3500′ to 6000′ on the main spur, and to about 5000–5500′ on lower spurs and ridges as on Gurulau and Penibukan, whereas in the more sheltered valleys it reaches a much higher altitude, both on the southern and northern slopes. On the latter I have Mr. Maxwell's authority for stating that the primary forest extends to a much lower level, as the population is very sparse, and in fact, around the base of the northern ridge there is an uninhabited tract where the primary forest prevails.

This primary high forest is left intact from 3500-4000′ by the Dusuns, who no doubt appreciate its value as the sole restraining agent in the conservation of the mountain slopes. Any weakening of this protective buttress would result in the wholesale devastation of the immediately

surrounding country. Kinabalu is also the watershed for the whole northern portion of the country, and it is its magnificent forest growth alone which restrains the terrific force of water that pours down from the granite core, restricting the same to the courses mapped out in the sequence of the ages. Once interfere with that growth and all the clay slopes of the mountain with the homes of the inhabitants, whom bitter experience no doubt has taught to respect the agent of their well-being, will be washed towards the coast and the granite core exposed in its uncompromising nakedness to the unrestrained fury of the elements. The whole area of the primary forest should therefore be rigorously reserved.

3. *The mossy forest.*

Beginning on the southern spur at 6000′ and occurring in intervals again at 7500′ and at 9000′. On the Maraiparai spur it obtains from 5500–8000′, losing itself on the granite core, whilst on Penibukan and Gurulau spurs it is found on the ridges at about 5000′ in each case.

4. *The scrub formation* on the exposed serpentine.

Apparently limited to favourable conditions of illumination and unfavourable edaphic conditions, being found only on the disintegrating serpentine of the exposed ridges, which is converted into a clay soil holding water tenaciously, and forming a cold clammy substratum that limits all growth to shrubby plants. This serpentine being exposed on the Maraiparai at 5000–5500′, we find the same association on that small area. In cases where the rock is not so exposed, as where the ridge broadens out, small spaced trees grow gregariously.

5. *The low sheltered forest.*

Of densely-growing trees about 7 m. in height, with little undergrowth, and what there is suggestive of prevailing acid conditions. Sandstone rocks occur in this formation and in parts standing water, which apparently does not affect the plant association. This formation extends from about 9500′ to 10,500′; therefore Stapf's *upper mountain zone* would include the last three formations.

6. *The sub-summit dwarf forest.*

Fully exposed to the light and consisting of symmetrical dwarf trees in close association and about 3 m. in height, with no undergrowth, but showing a shrub sub-formation where the trees open out.

7. *The granite core.*

Showing the open shrub-formation facies, members being limited entirely to the cracks in the exposed granite; the plants, chiefly shrubby, are reduced

in stature and clipped by the wind to equal height, whereas the great radiation from the rock clips back the side branches, giving the plants the appearance of a well-kept box edging. The force of this factor is shown on one spot where the Kadamaian torrent spreads in its descent over a granite wall, and there stoloniferous herbaceous plants spread over the rock, the constant presence of the water neutralising the effects of radiation. The one exception to the granite-crack formation was seen in the case of a small colony of *Centrolepis philippinensis*, the minute plants of which were growing gregariously in a small bay formed in a sheltered and shady channel of the Kadamaian, where a little sand had accumulated and they were protected from the sun and wind.

These last two formations would be included in Stapf's *summit zone*, viz., above 10,500′.

The bog association referred to by Dr. Stapf, on the strength of the notes of previous collectors, was not observed by me.

5. Kiau to Kotabelud and Tuaran.

We returned to Kiau on the 27th of February, the expedition having proved most successful, thanks entirely to Mr. Maxwell's able and sympathetic management. The weather had been magnificent, rain having only fallen on the afternoon and night spent at Kamburangau. Needless to say, this fact was exultantly attributed by the Dusuns, who were equally gratified at the success achieved, to the efficacy of the part played by them in the strict observance of their traditional customs.

For more practical particulars and details of the ascent, I must refer to Mr. Maxwell's report (**19**), in which, however, he informs me the names of places are most inaccurately spelt, proofs unfortunately not having been submitted to him. I acknowledge my indebtedness to him for the native names and topographical information in reference to Kinabalu.

We left Kiau the next day for Koung by the bridle-path which skirts the northern face of the ridge till it reaches the crest, whence it gradually descends to the Tampussuk and to Koung-Nukok, a symmetrical two-peaked hill, which closes the view towards the coast and is now clothed in forest to the top.

Seen from Koung, the majestic crown of Kinabalu overtowers to the right the one or two puny ridges which alone intervene between us and its forbidding heights. Koung is a most ideally situated Dusun village, in a lovely valley on the banks of the Tampussuk, dominated by the familiar pointed tops of Nukok mountain, called Saduk Saduk by the coast Dusuns, from its resemblance to a pointed native hat.

This place used to be an old police-station in the troublous times, which it

is now so difficult to realise only date a few years back. The old "Fort," as it is called, is still standing, built on stones and constructed to repel treacherous attack.

A bamboo rest-house was built with the advent of the "rentis" on the opposite side of the river, and just below it is a secluded bathing-pool, near which a projecting bank was covered with the handsome coriaceous fronds of *Photinopteris speciosa*. *Cœlogyne Dayana* and *Appendicula rupicola* were brought in by the natives.

The native bamboo houses are dotted about the close-cropped green-sward of this ideal spot, with coco-nut and Areca palms waving over them. From each side of the flat, lawn-like river-banks which limit the valley, rise the steep mountain-sides through which the river has cut its way, clothed in secondary jungle where too steep for cultivation; but otherwise many small chalets mark the extensive hill-padi cultivation.

From Kiau we passed through young jungle and old and recent clearing; but on leaving Koung a fine secondary forest clothed the sandstone hills, which run up to 2000–3000′ and which are skirted by the "rentis." The native track keeps to the bed of the Tampussuk, which it crosses and recrosses several times, following the line of the river, and it is still always used by natives.

Between Koung and the Kabayo old rest-house were many fine *Eucalyptus* trees, probably of the same species as that seen near Renagong, but neither in flower nor fruit; other trees present were *Decaspermum paniculatum*, *Randia densiflora*, *Perrotettia alpestris* var. *philippinensis*, with small white flowers, the yellow-flowered *Garcinia Motleyana*, *Clerodendron infortunatum*, and *Macaranga hypoleuca* var. *borneensis*, the latter in fruit.

As undergrowth, *Aralia ferox*, 6 m. high, and *Dioscorea pyrifolia* in fruit only, with the herbaceous *Pellionia kabayensis*, *Pentaphragma viride* and *Selaginella Willdenowii*, were general. On one steep bank I found a mass of *Marchantia emarginata* showing vegetative proliferation of both ♂ and ♀ sporophores. It was associated with the moss *Rhacelopus acaulis* and a small *Eriocaulon* sp.

At about 500′ huge blocks of waterworn granite are exposed, lying unconformably in the sandstone, which shows how the hills have been cut down to their present level by the river, a fact also remarked on and referred to by Spencer St. John (**7.** 242). Hatton (**11.** 225) also mentions that it is a tradition of the natives that the Kinabalu mountains extended as far as the coast many years ago.

After Ghinambur, where one stops for the night, *Sterculia campanulata*, in leafless condition, was shedding its green flowers; and as we rode out of the jungle on to the open plains of the Tampussuk *Parkia Roxburghii* reappeared, with the weedy upgrowth that heralds human habitation. Here

the "rentis" was built up to about 1 m. above the level surface, to keep it out of the mud which even in dry weather the buffaloe manages to churn up; but when wet all trace of the path is, I believe, entirely lost.

The police-station at Kotabelud is situated on an eminence commanding the alluvial plains, which in the foreground are bounded by open sandstone hills, bare and red, deforestation of these spurs having had a result similar to that at Jesselton.

Landwards the bare hills are succeeded by the forest-clad outlines of the main range, and above all the giant ridge of Kinabalu, which from this western aspect is seen to stretch northwards for 10 miles in a straight line.

These alluvial plains of the Tampussuk have been cultivated by generations of Dusuns, whose "campongs," picked out by coco-nut and Areca palms, dot its area. Rice being the staple food of the inhabitants, any flat area is of enormous value in such a hilly country, and the people have evolved a regular system of irrigation for the water-rice which is so essential to their welfare.

I spent one day at Usakan, on the sea-coast, about 7 miles from Kotabelud, for the purpose of collecting seaweeds.

The "rentis" to Usakan skirts the cleared sandstone foothills, which are covered with the fine *Gardenia Merrillii*, mentioned by both Spencer St. John (**7**. 242) and Burbidge (**9**. 249), and leads over the Tampussuk plain to the mangrove-fringed Abai river, where crossing to the opposite bank we emerged on to open foothills again, the crests covered with "Lalang" associated with *Sorghum serratum* and quantities of *Nepenthes gracilis*, apparently a typical xerophilous plant.

Usakan itself is a lovely bay, bounded by two jutting sandstone promontories, on which I collected *Sterculia fœtida*, *Arytera littoralis* f. *rufescens*, *Ficus indica*, *Commersonia echinata*, all with branches drooping into the sea, whilst isolated specimens of *Cycas circinalis* grew on the rocks. Between the promontories was a beautiful sweep of *Casuarina*-fringed white sand, only broken where a few mangroves marked the egress of a small stream from the foothills, which run parallel to the bay. Skirting the sandy beach, *Glochidion littorale* showed its pretty pink fruit, accompanied by a colony of *Sophora tomentosa*. A single fine *Pandanus dubius*, about 2 m. high, spread its glistening broad leaves, and a clump of *Cæsalpinia Nuga* was in the full glory of its lovely yellow blossom. Behind the mangroves a mass of pure coral detritus had accumulated, caught and retained by their roots, in which a large colony of *Cycas circinalis* luxuriated in all stages of growth. On the beach the following marine algæ were collected :—*Laurencia papillosa*, *Corallopsis Opuntia*, *Gymnosorus variegatus*, *Dictyota dichotoma*, *Enteromorpha compressa*, *Chætomorpha obscura*, *Halimeda Opuntia*, *H. Tuna*, and *Udotea orientalis*. Rising on to the foothills we struck the same open sandstone formation as

already described for Jesselton. *Eurycoma longifolia* with brownish-yellowish flowers, and *Symplocos oblongifolia* with white flowers, were associated with it.

Leaving Kotabelud for Tuaran by a very good bridle-path, we first passed over the foothills through the dominant *Gardenia Merrillii*, then through a succession of widely spaced trees, *Pternandra cærulescens* being covered with its little stem-borne blue flowers, till the trees passed into a very fine secondary forest, showing that, as at Jesselton, open sandstone carrying a scrub association is a secondary condition due to human agency. Beautiful groups of a *Corypha* were abundant; also magnificent clumps of "Nibong" (*Oncosperma filamentosum*). The "rentis" ran up through these beautiful hills to about 2000′, passing prosperous-looking "campongs" embedded in luxuriant vegetation. I did not collect at all, but several times saw the handsome flowers of *Uvaria purpurea*, like purple-red camellias.

We dropped to sea-level at Tenghilan, a small open padi-field with *Jussieua repens* and *Monochoria hastæfolia* floating in the side ditches. On rising ground, where a rest-house was charmingly situated on a park-like mound, the leafless *Sterculia campanulata* was shedding its formless green flowers. From Tenghilan we floated down through the mangrove-swamp of the Sulaman river, past pile villages, to Kindoo, where the "rentis" starts for Tuaran. At Kindoo cleared sandstone began immediately behind the mangroves, with *Gardenia Merrillii* and *Gahnia tristis* predominant.

Then over some hills and secondary forest on to the fertile plains of the Tuaran river, noted for their pea-nut cultivation. Tuaran also boasts a "tamil" or native fair, which is a picturesque and busy sight, held once a week.

Mr. Bunbury pointed out to me the famous clay-beds, banded in beautiful colours, which are renowned throughout the countryside as an article of diet. Dr. Cullis, who kindly looked at a sample I brought back, declared it to be clay of the very purest consistency, a substance successfully used as an adulterant in more sophisticated countries, but which cannot be assimilated by the human system.

The station is in an ideal situation, from which one looks over the Tuaran river on one side and towards Kinabalu on the other, the latter, however, here reduced to a three-quarter view.

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IV. SYSTEMATIC ACCOUNT OF THE PLANTS COLLECTED IN THE PROVINCES DENT AND KEPPEL, BRITISH NORTH BORNEO, IN JANUARY, FEBRUARY AND MARCH, 1910.

[*New records for Kinabalu, in comparison with Stapf's* (**17**) *list, have been distinguished by an asterisk. Collectors' names and localities* (*with the exception of the Cyperaceæ and Graminaceæ*) *have only been given for British North Borneo and Labuan.*]

PHANEROGAMÆ.

ANGIOSPERMÆ.

DILLENIACEÆ.

WORMIA EXCELSA, *Jack in Malay Misc.* ii. no. vii. 69.

Tenom, 700′, near railway track, in marshy secondary forest. Fl. Jan. 2806.

Distrib. Borneo (Sarawak ; D. Borneo). Malay Peninsula, Java, Sumatra.

A handsome tree, 30 m. high, with magnificent yellow flowers, the dark mauve stamens and styles forming a fine contrast to the clear yellow petals. It occurs growing gregariously, as in Java (Koord. & Val., Boomsoort. Java, in Meded. 's Lands Plantent. xi. 169), in partially cleared marshy secondary forest. The leaves vary in denticulation, the margins being almost entire in some specimens.

WORMIA SUFFRUTICOSA, *Griff. Notul.* iv. 706, *Ic.* iv. 649. f. 1.

Tenom, slopes above, 1500′, secondary forest. Fl. Jan. 2930.

Distrib. Borneo (Brunei ; Sarawak ; D. Borneo). Malay Peninsula, Sumatra, Banka, Billiton, and Moluccas.

A tree with handsome yellow flowers and yellow stamens and styles.

MAGNOLIACEÆ.

DRIMYS PIPERITA, *Hook. f. in Hook. Ic. Pl.* t. 896.

Kinabalu, from Lobang rock to above Pakapaka cave, 5000–11,000′. Fl. Fr. (young), Feb. 4426.

Distrib. Borneo (B. N. B. Kinabalu, *Low* and *Haviland*, 5500–11,000′ : Lobang Peak, *Lobb* ; Sarawak). Philippines and New Guinea.

This charming species is very abundant on the slopes of Kinabalu, occurring also on Gurulau spur at 5000′, and on the Maraiparai spur up to 8000′.

ANONACEÆ.

Uvaria purpurea, *Blume, Bijdr.* 11.

Tenom, 700′, secondary forest. Fl. Jan. 2805.

Distrib. Borneo (B. N. B. Kinabatangan and Tinkayu, *Creagh*). Malay Peninsula, Java, Celebes, Aru, Philippines; Indo-China.

A handsome tree with fine purple-red flowers, resembling a single camellia. It was seen in several localities about Tenom and also in the secondary forest clothing the sandstone hills between Kotabelud and Tenggilan, at about 1000′. Dissections of this plant, the flowers of which were put up in formalin, agree in every particular with the excellent figures in Blume's 'Flora Javæ,' Anon. t. 1 A & 13 A. The two specimens of Creagh's seem identical with mine and show the minor variation in the shape and pubescence of the leaves traceable in the Malayan series at Kew and the British Museum and in the set of Dr. Pierre's Cochin China plants at Kew.

Sphærothalamus insignis, *Hook. f. in Trans. Linn. Soc., Bot.* xxiii. (1860) 156, t. 20 B.

Tenom, 900′, foothills, secondary forest. Fl. Jan. 2685.

Distrib. Borneo (B. N. B. Madai, *Creagh*; Sarawak).

A forest tree, very general about Tenom, flowering from 1 m. in height. The flowers are conspicuous, hanging singly or two or three from the axils of the leaves, with a brown membranous calyx and erect fleshy orange petals. First collected by Lobb and labelled "Borneo." Hooker founded a new genus on this specimen. In the type specimen the leaves are 5·2 dm. in length and 1 to 5 dm. in breadth, and the flowers 7·5 cm. long. A specimen of Beccari's (2964 Herb. Kew.) shows one leaf more acuminate, and another much broader and even longer than the type. In my series the leaves range from 1·5 to 2·5 dm. and the flowers from 1·5 to 5 cm. in length. An instructive intermediate form between these two series is shown in Creagh's Madai plant (in fruit only) in which the leaves are 3 dm. long. In a flower, put up in formalin when collected, dissection showed four ovules in each ovary, the latter surmounted by spongy styles attached together by a glutinous secretion, points which Hooker could not determine in the material at his disposal.

Artobotrys suaveolens, *Blume, Fl. Jav.*, Anon. 62, t. 30, 31 D.

Jesselton, clearing in secondary jungle. Fl. Jan. 2580.

Distrib. Borneo (Sarawak; D. Borneo). Malay Peninsula, Java, Sumatra and Celebes; India.

Popowia sp.

Tenom, 700′, in sec. forest. Bud. Fr. Jan. 2679.

Fruit red. The material is too incomplete for determination.

Goniothalamus roseus, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 130.

Kinabalu, 4000–5000′, in high forest. Fl. Feb. 4105.

Distrib. Borneo (B. N. B. Kinabalu, 3000′, *Haviland*).

A handsome tree, common about Lobang rock, with pendulous pink flowers.

MENISPERMACEÆ.

Cissampelos Pareira, *Linn. Sp. Pl.* 1031.

Tenom, 700′, in sec. jungle. ♂. Jan. 2680. Railway track to Melalap. ♂. Jan. 2833.

Distrib. Borneo (B. N. B. Belit, *Creagh*). General in the tropics and subtropics.

CAPPARIDACEÆ.

Gynandropsis sp., affinis G. pentaphyllæ, *DC. Prod.* i. 238, sed capsulis brevioribus, magis expansis.

Melalap, 800′, open spaces. Fl. Fr. Jan. 2730.

G. pentaphylla is a weed, widely spread in the tropics.

I am indebted to Mr. J. R. Drummond for this determination.

PITTOSPORACEÆ.

Pittosporum ferrugineum, *Dryand. in Ait. Hort. Kew.* ed. 2, ii. 27.

Melalap, 800′, banks of Pengallan river, in sec. forest, ♂. 2740. ♀. Fr. 2741.

Distrib. Borneo (Sarawak ; D. Borneo). Malay Peninsula, Java, Sumatra, Nicobars, Andamans, New Guinea to East tropical Australia.

The above specimens were collected from two trees growing not far apart, and numbered at the time as two distinct species. No. 2740 had much denser inflorescences and no fruit on the tree ; No. 2741, on the contrary, bore flowers in single umbels and the tree was covered with bunches of orange fruit. Kooders & Valeton (Boomsoort. Java, in Meded. 's Lands Plantent. xvii. 55) describe this species as frequently diœcious.

POLYGALACEÆ.

*SALOMONIA CANTONIENSIS, *Lour. Fl. Cochinch.* 14 (1790).

Jesselton, bog, by race-course. Fl. Jan. 2603. Kaningau plain, 1000′, by bridle-path. Fl. Feb. 2977.

Distrib. Borneo (Brunei ; Sarawak ; D. Borneo). Malay Peninsula, Java, Amboina ; Indo-China to India.

This plant was also seen growing thickly in the padi fields at Kiau, at 3000′.

POLYGALA CHINENSIS, *Linn. Sp. Pl.* 704.

Kaningau plain, 1000′, in short grass amongst "Lalang." Fl. Fr. Feb. 2946.

Distrib. Borneo (Brunei). India, through Indo-China and Malaya to East Australia.

A spreading plant with minute, bright blue flowers.

HYPERICACEÆ.

HYPERICUM MUTILUM, *Linn. Sp. Pl.* 787.

Tenom, 700′, in damp open places. Fl. Jan. 2786.

Distrib. Borneo (B. N. B. Kinabalu, *Haviland*, 3000′).

General in tropical, subtropical, and temperate regions, with the exception of Europe.

Seen in open damp places through the country.

CRATOXYLON ARBORESCENS, *Blume, Mus. Bot. Lugd.-Bat.* ii. 17.

Tambunan plain, 2000′, in sec. forest. Fl. Fr. Feb. 3010.

Distrib. Borneo (Sarawak). Malay Peninsula and Indo-China.

A tree with red calyx, corolla and fruit.

GUTTIFERÆ.

*GARCINIA MOTLEYANA, *Pierre, Fl. For. Cochinch.* Fasc. vi. xxx, t. 83, I.

Between Kabayo and Ghinambur, 2000′, in sec. forest. ♂. Feb. 4293.

Distrib. Borneo (Sarawak ; D. Borneo).

A tree, with yellow flowers most abundantly produced on the old wood and in the axils of the leaves. This species was first collected by Motley near Banjermassing and subsequently by Haviland in Sarawak.

TERNSTRŒMIA LOWII, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 132.

Kinabalu, before and after Pakapaka cave, 9000–11,000′, tree, common. ♂. Feb. 4248.

Distrib. Borneo (B. N. B. Kinabalu, *Low, Haviland,* 9000′ ; Maraiparai spur, *Haviland,* 5500′).

Eurya reticulata, *Korth. Verh. Nat. Gesch. Bot.* 118, t. 17. 3.

Kinabalu, 12,000′, in sub-summit dwarf forest and on granite core. Fl. Feb. 4186. Summit, cracks in granite, 13,000′. Fr. Feb. 4205.

Distrib. Borneo (B. N. B. Kinabalu, *Low, Haviland,* 11,000–13,000′). Java, Sumatra.

*Saurauia media, *Korth. Verh. Nat. Gesch. Bot.* 125.

Kinabalu, Gurulau spur, above Kiau, 4000′, in sec. forest. Fl. Feb. 3974.

Distrib. Sumatra.

A tree, with the young leaves brown-red and the flowers white. The leaves in this plant are broader at the base than described by Korthals, and there are slight differences in the colour of the leaves and in the tertiary veins, which in Korthals' specimen at Kew form pronounced areoles, but otherwise it agrees perfectly with his description.

Saurauia ferox, *Korth. Verh. Nat. Gesch. Bot.* 132, t. 19.

Tenom, 900′, slopes above old Residency, in sec. forest. Fl. Jan. 2866. Between Kaningau and Apin Apin, 1500′, in sec. forest. Fl. Feb. 2966. Tambunan plain, 2000′, near Station, in sec. forest. 3008.

Distrib. Borneo (B. N. B. Madai, *Creagh* ; D. Borneo).

A small tree, characterised by white hyaline flowers with hairy calyces, produced in profusion on the old wood and in the axils of the upper leaves, which are aggregated towards the ends of the branches. In No. 3008 the hairs on the calyces were reddish in colour. The wood of this species is very pithy.

Schima brevifolia, *Stapf in Hook. Ic. Pl.* t. 2264.

Kinabalu, 9000–10,000′, in sheltered forest. Fl. Feb. 4271.

Distrib. Borneo (B. N. B. Kinabalu, *Low, Haviland,* 8000–10,000′).

A small tree with handsome white flowers, growing abundantly on the banks of the Kadamaian at the Pakapaka cave, and in low forest at 9500′.

MALVACEÆ.

Sida rhombifolia, *Linn. Sp. Pl.* 684.

Tenom, 700′, weed, everywhere near cultivation. Fl. Jan. 2633.

Distrib. Borneo (B. N. B. Papar, *Fraser* ; D. Borneo). Common weed in the tropics.

Urena lobata, *Linn. Sp. Pl.* 692.

Tenom, 700′, common weed. Jan. 2626.

Distrib. Borneo (Sarawak ; D. Borneo). Common weed in both hemispheres.

Hibiscus Abelmoschus, *Linn. Sp. Pl.* 696.

Tenom, 700′, native gardens and near cultivation, general. Fl. Jan. 2655.

Distrib. Borneo (B. N. B. Kiau, *Burbidge* ; Sarawak ; D. Borneo). Indigenous in South Asia. Cultivated throughout the tropics.

STERCULIACEÆ.

Sterculia fœtida, *Linn. Sp. Pl.* 1008.

Usakan Bay, overhanging the water, on sandstone rocks. Immature leaves. Fl. March. 4328.

Distrib. Borneo (B. N. B. Kudat, *Fraser*). From tropical E. Africa through S. Asia to N. Australia.

Sterculia translucens, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 136.

Kinabalu, Lobang rock, 5000′, high forest. Fl. Feb. 4110.

Distrib. Borneo (B. N. B. Kinabalu, 5000′, *Haviland*).

A tree, with pretty pink flowers, evidently general, as the fallen corollas were seen throughout the forest both on Gurulau and Maraiparai spurs.

Sterculia campanulata, *Wall. ex Mast. in Hook. Fl. Brit. Ind.* i. 362.

Tenggilan, near Sulaman river, 300′, in sec. forest, on sandstone hills. ♀. Fr. March. 4346.

Distrib. Malay Peninsula, Java.

A forest tree, leafless at the time of flowering, with green flowers. Also abundant in the secondary forest of the sandstone hills between Kabayo and Ghinambur, at 500′. I have carefully compared this material, consisting of ♂ flowers and ♀ in fruit, with R. Brown's description and excellent figures (*Pterycymbium javanicum*, Bennett and Brown in Pl. Jav. Rar. 219. t. 45). Horsfield's note on the habitat of this species in Java might also have been written of the Bornean plant.

Kleinhovia hospita, *Linn. Sp. Pl.* ed. 2, 1365.

Tenom, 700′, near native cultivation, general throughout the country. Fl. Fr. Jan. 2621.

Distrib. Borneo (B. N. B. Tinkayu, *Creagh*; D. Borneo). Through India, Indo-China, Malaya, Philippines, and New Guinea to Polynesia. Mascarene Islands.

MELOCHIA ARBOREA, *Blanco, Fl. Filip.* ed. 1, 524.

Tenom, 700′, clearings, abundant throughout the country. Fl. Jan. 2645.

Distrib. Borneo (Sarawak). Malaya to Indo-China, India, and Mauritius.

COMMERSONIA ECHINATA, *Forst. Char. Gen.* 44, t. 22.

Jesselton, edge of mangrove swamp. Fl. Fr. Jan. 2594. Sapong, near Tenom, 800′, in young jungle. Fl. Fr. 2718.

Distrib. Borneo (Labuan, *Motley* ; Sarawak ; D. Borneo). Through India, Indo-China, Malaya, Philippines and New Guinea to Polynesia and East tropical Australia.

Common throughout the country in young jungle.

TILIACEÆ.

TRIUMFETTA SUFFRUTICOSA, *Blume, Bijdr.* 113.

Apin Apin, 1500′, on banks of river in recent clearing, abundant. Fl. Fr. Feb. 2988.

Distrib. Borneo (B. N. B. Kadamaian river, 2500′, *Haviland*). Java, Timor, Philippines, New Guinea, Solomon Islands, Bismark and Louisiade Archipelagos, Christmas Island.

CORCHORUS CAPSULARIS, *Linn. Sp. Pl.* 529.

Melalap, 800′, clearings. Fl. Fr. 2732.

Distrib. Borneo (Sarawak). Cultivated in most tropical countries for the fibre known as "Jute."

LEPTONYCHIA GLABRA, *Turcz. in Bull. Soc. Nat. Mosc.* xxxi. (1851) I. 223.

Tenom, 700′, swampy ground near the railway in sec. forest. Fl. Fr. Jan. 2804.

Distrib. Borneo (Labuan, *Motley* ; Sarawak). Malay Peninsula, Sumatra, Java, Celebes, Indo-China, and Andamans.

RUTACEÆ.

CLAUSENA EXCAVATA, *Burm. f. Fl. Ind.* 87, t. 29.

Kaningau and Apin Apin, 1000–1500′, in sec. forest. Fl. Jan. 2965.

Distrib. Borneo (B. N. B. Tinkayu, *Creagh* : D. Borneo). Malay Peninsula, Java, Sumatra, Philippines ; Indo-China to E. India.

A tree with white flowers, common from Tenom to Apin Apin.

SIMARUBACEÆ.

BRUCEA SUMATRANA, *Roxb. Fl. Ind.* i. 449.

Tenom, 700–1000′, in sec. forest and recent jungle, general. Fl. Fr. Jan. 2662.

Distrib. Borneo (D. Borneo). E. India, Indo-China, throughout Malaya to N.E. Australia.

EURYCOMA LONGIFOLIA, *Jack in Malay Misc.* ii. no. VII. (1822) 45.

Usakan, 200′, on open sandstone spurs. Fl. March. 4323.

Distrib. Borneo (B. N. B. Balambangan, *Fraser*: Sandakan, *Creagh*; Labuan, *Burbidge*; Sarawak; D. Borneo). Malay Peninsula, Java, Sumatra Philippines; Indo-China.

MELIACEÆ.

AMOORA CURTISPICA, *Gibbs*, sp. nov.

Arbor excelsa, dioica. *Ramuli* teretes, cinerascentes. *Folia* longepetiolata, imparipinnata; rhachis alata; foliola circiter 5, subopposita vel alterna, oblonga, sessilia, apice longiuscule obtuso-cuspidata, basi ampla, auriculata, margine integerrima, supra glabra, subtus stellato-hirtella. *Racemi* pedunculati, axillares, aggregati, petiolo breviores; racemi ♂ graciles, parce ramosi, racemi ♀ breviter spicati. *Calycis* lobi 4–5, rotundi, obtusi, extus dense stellato-hirsuti. *Petala* 3, obovata, crasso-incurvata, glabra. *Tubus* stamineus late cylindricus, glaber, antheris paullo exsertis. *Ovarium* (fl. ♀) stellato-hirtellum, 3-loculare, in quoque loculo 2-ovulatum, stylo crasso, stigmate 3-lobo, tubum stamineum æquans. *Fructus* coriaceus, capsularis, 3-valvis, seminibus pro loculo solitariis, 1–2 tantum maturantibus arillatis.

Hab. Tenom, 700′, in marshy sec. forest. ♂ 2808. ♀. and fr. Jan. 2801.

Leaves with the petioles 3–6 dm. long and 1–2 dm. broad, the folioles being 13 cm. in length and 5·5 cm. in breadth; the veins, impressed on the upper surface, and prominent on the lower, show 7–9 curved and ascending veins on each side. The flowers are yellow, the spreading ♂ racemes 5–6 cm. long and about the same in breadth; the ♀ spikes are very minute, only ±3 cm. long and occurring in 2 or 3 in the axils of the leaves. The calyx is ±1 mm. and the petals ±3 mm. long, the staminal tube being 2·5 mm. in length and 3 mm. broad, with 6 sessile stamens, just visible at the apex. The fruit is of a delicate pink colour, 1·5 cm. high and 2 cm. broad, while the seed is ±1 cm. in length, enclosed in a reddish aril. This plant would come into De Candolle's section *Pseud-Aglaia*, on the strength of the three petals and six stamens, with the spikes shorter than the leaves. This species is marked by the extreme shortness of the spikes, which are only ±3 cm. in length. In this respect it seems to approach *A. herniana*, Merrill, though it differs in the number of the stamens.

ILICINACEÆ.

Ilex revoluta, *Stapf in Hook. Ic. Pl.* t. 2263.

Kinabalu, 10,000–11,500′. Pakapaka to granite core, in low and sub-summit dwarf forest. Fl. Fr. Feb. 3127.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*).

A small tree with white flowers.

CELASTRACEÆ.

Perrotettia alpestris, var. philippinensis, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 141.

Between Koung and Kabayo, 1000′, off the bridle-path, in sec. forest. Fl. Feb. 4292.

Distrib. Borneo (B. N. B. Dahobang river, 3000′, *Haviland*). Philippines.

Tree, 20 m. in height, with white flowers. In the above specimens the flowers are all tetramerous.

RHAMNACEÆ.

Alphitonia excelsa, *Reis. ex Endl. Gen. Pl.* 1098.

Jesselton, in young jungle. Fl. Fr. Jan. 2585.

Distrib. Borneo (B. N. B. Gaya, *Creagh*; Sarawak). Philippines, New Guinea to N.E. Australia, Sandwich Islands, and Polynesia.

AMPELIDACEÆ.

Pterisanthes cissoides, *Blume, Bijdr.* 193.

Kinabalu, 4000′, Gurulau spur, above Kiau, in primary high forest. Fl. Fr. Feb. 3994.

Distrib. Borneo (Brunei? Koon Hill, *Low*). Malay Peninsula, Java.

This specimen consists of an inflorescence only, red in colour when collected, with green fruits. The shape of the inflorescence, the structure of the ☿ flowers and the fruits, and the long pedicels of the marginal flowers are characters which agree with the above species.

Tetrastigma papillosum, *Planch. in DC. Mon. Phan.* v. ii. 429.

Apin Apin, 1500′, in sec. forest, abundant. ♂ Feb. 2983.

Distrib. Borneo (Sarawak; D. Borneo). Java, Sumatra.

This vine was very general as a rampant grower in the forest from Kaningau to Tambunan. I only noticed the ♂ plant, which has green, sweet-scented flowers. Specimens in the Kew Herbarium show the ♀ form, and of one labelled "Lobb, Borneo," and another from Kuching (*Haviland*, 2088) labelled "flowers pale, slightly scented," I was allowed to dissect the

flowers. My specimens do not show the papillate excrescences on the stem, but, as Planchon states in his monograph, this character is not seen on all branches.

Cissus hastata, *Miq. Fl. Ind. Bat., Suppl.* i. 517.

Jesselton, in open clearing. Fl. Jan. 2593.

Distrib. Borneo (B. N. B. Koung, 2000′, *Haviland*). Malay Peninsula, Java, Sumatra.

A fleshy climber with wax-coated stem and red tendrils.

Leea sambucina, *Willd. Spec. Pl.* i. 1177.

Tenom, 700′, railway track to Melalap, sec. jungle. Fl. Fr. Jan. 2818.

Distrib. Borneo (B. N. B. Kudat, *Fraser*; Sarawak; D. Borneo). India, through Indo-China and Malaya to N.E. Australia and Polynesia.

SAPINDACEÆ.

Cardiospermum Halicacabum, *Linn. Sp. Pl.* 366.

Kaningau plain, 1000′, near Baiaio river, in short grass on the bridle-path. Fl. Fr. Feb. 2970.

Distrib. Borneo (B. N. B. Bilit, *Creagh*; Sarawak; D. Borneo). Tropics and subtropics generally.

Guioa pleuropteris, *Radlk. in Sitzb. Math.-Phys. Acad. Muench.* ix. (1879) 611.

Jesselton, a small tree in sec. jungle. Fl. Fr. (young) Jan. 2588.

Distrib. Borneo (B. N. B. Ulu Tawaran, 2000′, *Haviland*; Sarawak; D. Borneo). Malay Peninsula, Sumatra, Philippines; Indo-China.

Arytera littoralis, *Blume, Rumphia*, iii. 170, forma *genuina*, Radlk. in lit.

Tenom, 800–900′, foothills in sec. forest. ☿. Jan. 2664.

Distrib. Java, Sumatra, Celebes, Buta and Buru Islands.

"A fine tree, 20 m. in height, with dark green leaves and masses of white inflorescences."

—— forma *rufescens*, Radlk. in lit.

Usakan Bay, seashore, abundant. ♂. March. 4332.

Distrib. Philippines.

"A tree, fringing the seashore on sandstone spurs, the branches dipping into the water, with yellow flowers, the colour being no doubt due to the number of anthers, as the flowers are just opening. They show the parts in fours with 8 anthers."

—— forma *angustifolia*, Radlk. in lit.

Tenom, 80–90′, foothills in sec. forest. ♂. 2697.

Distrib. Java, Sumatra.

"Tree, $\pm$16 m. in height, with white flowers."

Professor Radlkofer, who kindly determined the above specimens, writes as follows :—" If one distinguishes, as I did many years ago (Sitzb. Math.-Phys. Acad. Muench. ix. (1879) 552), *Arytera rufescens*, Radlk. (*Zygolepis rufescens*, Turcz. 1848, *Ratonia rufescens*, Turcz. 1863), *A. littoralis*, Bl., and *A. angustifolia*, Radlk., n. 4332 of your plants may be considered as belonging to the first, n. 2664 to the second, n. 2697 to the third.

" But in the meantime I have got so many intermediate modifications, that I am now inclined to consider not only *A. angustifolia* as a mere form of *A. littoralis*, but also *A. rufescens*, distinguished only by a more compact inflorescence and rather reddish (than yellowish) ferruginous flower parts.

" The exact names would then be :—

4332. *Arytera littoralis*, Bl., forma *rufescens*, Radlk. in Sitzb. Math.-Phys. Acad. Muench. ix. (1879) 555.—Syn. *A. rufescens*, Radlk.

2664. ,, ,, forma *genuina*, Radlk. *ibid.*

2697. ,, ,, forma *angustifolia*, Radlk. *ibid.*—Syn. *A. angustifolia*, Radlk. *l. c.* 552.

" There is also a var. *major*, King, which will become a 'forma *major*, Radlk.' and to which may be adjoined a 'forma *minor*, Radlk.,' represented by some specimens from Cochinchina and so on."

Otophora fruticosa, *Blume, Rumphia*, iii. 142.

About Tenom and Kaningau, general as undershrub in the sec. forest. Fl. Jan. 2625.

Distrib. Borneo (B. N. B. Kudat, *Fraser* ; Kudat, Banguey, Tandjong Batu, *Creagh*). Java, Moluccas, and Philippines.

Otophora imbricata, *Blume, Rumphia*, iii. 144.

Tenom, 700–1000′, general in the sec. forest. Fl. Fr. (young), Jan. 2863.

Distrib. Borneo (Labuan, *Motley* ; Sarawak ; D. Borneo).

A most characteristic shrub, $\pm$4 m. high, *Aralia*-like in habit, consisting of several simple stems with huge leaves about a metre long, aggregated at the apices, and a terminal inflorescence as long as the leaves. The perianth of the flowers is red and the fruit yellow in colour when collected. Motley notes on a specimen (808, Herb. Kew.) that " the wood is exceedingly hard and is preferred above all others to make hooks for catching alligators "; he gives the native name as " Kayu Mata Hari."

Harpullia arborea, *Radlk. in Sitzb. Math.-Phys. Acad. Muench.* xvi. (1886) 404.

Kaningau plain, 1000′, near Station, in sec. jungle on banks of stream. ♂. Feb. 2955.

Distrib. Philippines.

This plant was kindly determined for me by Mr. Wright, as closely allied to *H. arborea*, Blume. On dissection of a flower (52081, *Loher*, Herb. Kew.)

the claws of the petals were found little shorter than in the above, and the calyx perhaps slightly more villous, otherwise there was no estimable difference.

ANACARDIACEÆ.

BUCHANANIA FLORIDA, *Schauer*, var. LUCIDA, *Engl. in DC. Monog.* 180.

Jesselton, 100′, in young jungle. Fl. Fr. Jan. 2586.

Distrib. Borneo (Labuan, *Lobb*; Sarawak; D. Borneo). Java, Sumatra, Philippines.

*SEMECARPUS BUNBURYANA, *Gibbs*, sp. nov.

Frutex amplissimus. *Folia* ad apices ramulorum congesta, elongato-obovata, obcordata, supra glaberrima, coriacea, nervis primariis arcuatis supra planis albidis subtus prominentibus sparse hyalino-pilosulis, petiolo decurrente. *Panicula* laxa, quam folia brevior, floribus glomerulatis paucifloris unilateralibus polygamis; pedicelli hirsuti, supra medio articulati, ad basin bracteis squamosis hirsutis onusti. *Sepala* minuta, glabra, ciliata, acuta, valvata. *Petala* lanceolata, oblonga, glabra, apice inflexa, acuta, valvata. *Flos* ♂ ovario rudimentario glabro. *Flos* ♀ disco annulario, staminibus ovarium superantibus, stylo trifido, stigmate capitato. *Drupa* ignota.

Hab. Kinabalu, Kiau, on the bridle-path to Koung, in sec. forest. Fl. Feb. 3964.

A shrub or small tree of *Aralia*-like habit, the large leaves being aggregated towards the ends of the branches. The largest leaf on the specimen is 4 dm. long and 1·5 dm. broad near the apex, where it is suddenly contracted into a cuspidate point, more or less 1 cm. long; the lamina narrows gradually into the petiole, until only 1·3 cm. broad at the obcordate, almost auriculate base; the petiole is ±0·5 mm. in length, and the leaves may be almost described as subsessile. The inflorescence is 2 dm. long, branching sparsely; with the white flowers arranged in half-whorls at intervals on the secondary rhachis. The pedicels are 3 mm. in length; the lobes of the calyx are 1 mm. long and longitudinally veined, as are also the petals, which are 5 mm. long and 2 mm. broad. In the ♂ flower the stamens are 3 mm. in length, slightly fleshy, with a very minute rudimentary ovary; in the ♀ flower the stamens are the same length as the ovary, which is ±2·5 mm. high and 3 mm. broad, the styles and stigma being 1 mm. long and rather laterally inserted.

This plant is nearest to *S. magnifica*, K. Schum., which it resembles in the shape and size of the leaves, but it differs in the glabrous habit, the few flowered glomerules, and the lax inflorescence. The leaves show glaucous undersides with the veins less numerous and more arcuate.

This species has been named in honour of Mr. H. W. L. Bunbury, District Officer, to whom I was indebted for much thoughtful kindness during my stay in N. Keppel.

LEGUMINOSÆ. (E. G. Baker.)

Crotalaria verrucosa, *Linn. Sp. Pl.* 715.

Melalap, 800′, sandbanks in the Pengallan river. Fl. Fr. 2743.

Distrib. Borneo (B. N. B. Kudat, *Fraser*; Sarawak). Widely distributed in the tropics.

Uvaria crinita, *Desv. Journ. Bot.* i. (1813) 123.

Between Tenom and Melalap, 700′, open "Lalang" flats. Fl. Jan. 2725.

Distrib. Borneo (B. N. B. Banks of Tuwaran River, *Burbidge*; D. Borneo). Widely distributed.

Indigofera hirsuta, *Linn. Sp. Pl.* 751.

Kaningau plain, near Station, 1000′, in open "Lalang." Fl. Jan. 2971.

Distrib. Widely distributed.

Smithia conferta, *Smith in Rees Cycl.* xxxiii. no. 2 (1816).

Kaningau plain, near Station, 1000′, in open, amongst "Lalang." Fl. Jan. 2944.

Distrib. Java, Timor, N. Australia; China and India.

"Flowers yellow."

Adinobotrys Nieuwenhuisii, *Dunn in Kew Bull.* (1911) 196.

Milletia Nieuwenhuisii, J. J. Smith in Bull. Dép. Agric. Ind. Néerl. iii. (1906) 17.

Tenom, 700–900′, general in sec. forest. Fl. Jan. 2683.

"Liane with thick contorted stems and huge cauline inflorescence. Flowers brown-red."

Distrib. Borneo (D. Borneo).

Fordia Gibbsiæ, *Dunn & Bak. fil. in Kew Bull.* (1911) 64, name only.

Arbuscula sec. cl. detectorem usque ad 7 m. alta. *Folia* imparipinnata, circiter 5-juga, foliolis glabris coriaceis ovatis vel oblongo-ovatis apice mucronatis apice ipso obtusis basi rotundatis vel subcuneatis, foliolis distalibus ± 17 cm. longis et 5·0–5·5 cm. latis, foliolis proximis ± 10 cm. longis ± 5·3 cm. latis, omnibus penninerviis, nerviis arcuatis. *Flores* parviusculi, secus rhachem fasciculati, in racemos dispositi. *Racemi* circiter 18–23 cm. longi, axillares, apices versus ramorum positæ. *Rhachis* fusco- vel ferrugineo-pubescens. *Calyx* totus 2·0–2·5 mm. longus, dentibus brevissimis. *Pedicelli* quam calyx sæpissime breviores. *Vexillum* extus pubescens cum ungue brevi 8·5–9 mm. longum. *Alæ* basi unguiculatæ, oblongæ, carinæ subæquilongæ. *Carina* naviculariformis, apice obtusa, cum ungue 8·5–9 mm.

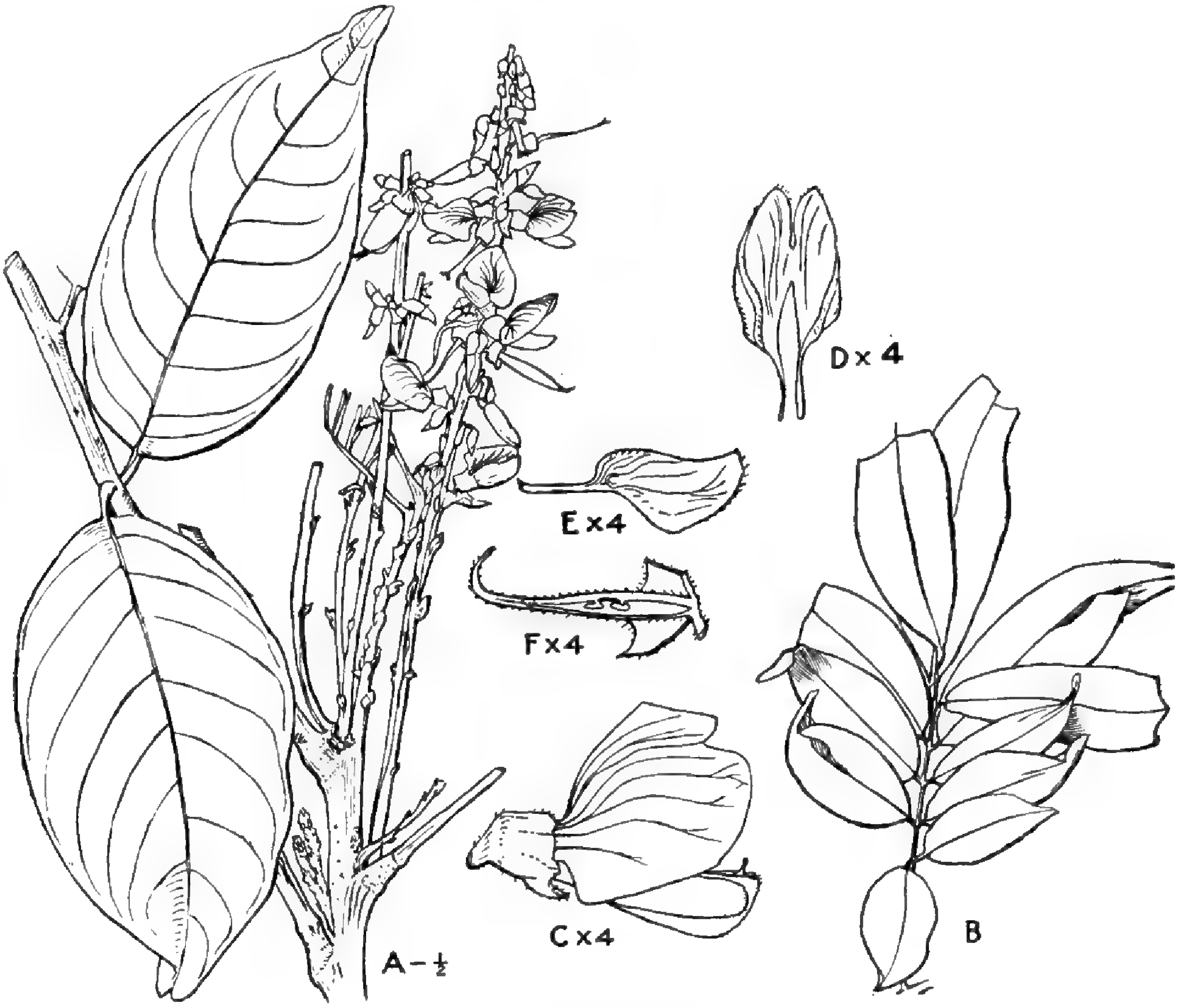
longa. *Ovarium* lineare, pubescens, sessile, biovulatum. *Stylus* inflexus, teres, stigmate parvo terminali.

Hab. Tambunan plain, near Station, open scrub, sandy soil. Feb. 3001.

A small tree about 7 m. high. The young foliage is red and the inflorescence is cauline and axillary. The flowers are purple.

This seems to agree with *Hose*, No. 334 in Herb. Kew., from Baram, and with *Haviland*, No. 3280, also from North Borneo.

Fig. 1.



Fordia Gibbsiæ, Dunn & Bak. fil. A. Inflorescence with part of leaf; B. Whole leaf, much reduced; C. Flower; D. Keel; E. Wing; F. Longitudinal section of ovary and calyx.

The pod in these specimens is oblanceolate, ± 8 cm. long and ± 21 mm. broad.

The genus *Fordia* has hitherto been known only by one species from China, which is characterised by having an erect stem with clusters of racemes on the old wood. The ovary is always biovulate, and the pod 2-seeded.

DESMODIUM SCALPE, *DC. Prod.* ii. 334.

Bundu Tuban, 1000′, clearings. Fl. Feb. 4317.

Distrib. Borneo (B. N. B. Kinabalu, 4000′, *Haviland*). Widely distributed.

Also seen at Lobang rock at 4500′.

DESMODIUM POLYCARPUM, *DC. Prod.* ii. 334.

Tenom, 800′, behind the Residency on the old bridle-path, in sec. forest. Fl. Jan. 2923. Kaningau plain, near Station, in open "Lalang." Fl. Jan. 2952.

Distrib. Widely distributed.

DESMODIUM HETEROPHYLLUM, *DC. Prod.* ii. 334.

Bridle-path from Tenom to Melalap, 900′, in open clearing. Fl. Jan. 2858.

Distrib. Widely distributed.

ALYSICARPUS VAGINATUS, *DC. Prod.* ii. 353.

Kaningau plain, near Station, 1000′, in open "Lalang." Fl. Jan. 2958.

Distrib. Widely distributed.

ERYTHRINA LITHOSPERMA, *Miq. Fl. Ind. Bat.* i. I. 209, forma.

Tenom to Kaningau, 700–1000′, general in sec. forest. Fl. Jan. 2907.

Distrib. Borneo (Sarawak). Java, Sumatra, Philippines; Indo-China.

"A graceful tree, 26 m., deciduous, with scarlet flowers. Native name 'Dadap utan,' in contradistinction to the 'Dadap,' or *E. indica*, Lam., which is planted about the 'campongs' and recognised as introduced."

MUCUNA PRURIENS, *DC. Prod.* ii. 405.

Tenom, 700′, in clearings and Chinese gardens, general. Fl. Fr. Jan. 2622.

Distrib. Widely distributed.

DIOCLEA REFLEXA, *Hook. f. in Niger Flora*, 306.

Between Korikot and Mensangau, 2000′, in sec. forest. Fl. Jan. 3026.

Distrib. Borneo (B. N. B. Penkulu Ampat, *Haviland*; D. Borneo). Philippines; tropical Asia and Africa.

CANAVALIA OBTUSIFOLIA, *DC. Prod.* ii. 404.

Melalap, 800′, general in open country by the river, amongst "Lalang," and along the edge of the sec. forest. Fl. Jan. 2738.

Distrib. Widely distributed in the tropics.

There are several specimens labelled *C. obtusifolia* in Herb. Kew. from

maritime situations in Borneo; they, Mr. Craib tells me, are referable to *C. lineata*, DC.

FLEMINGIA STROBILIFERA, *Ait. Hort. Kew.* ed. 2. iv. 350.

Tenom, 700′, general in recent clearings and along the edge of the sec. forest. Fl. Fr. 2842.

Distrib. Borneo (B. N. B. Banggi, *Fraser*; Sarawak). Malaya, India.

DERRIS MALACCENSIS, *Prain in Journ. R. As. Soc. Beng.* lxvi. (1897) 107.

Melalap, 700′, in sec. forest. Fl. Jan. 2848.

Distrib. Malay Peninsula.

"Liane, stem twiner, with pink flowers." I am indebted to Mr. H. N. Ridley for this identification.

DERRIS KORTHALSIANA, *Blume, ex Miq. Fl. Ind. Bat.* i. 143.

Tenom and Melalap, 700–900′, general in sec. forest. Fl. Jan. 2807.

Distrib. Borneo (D. Borneo). Sumatra.

"Liane, with light pink flowers."

SOPHORA TOMENTOSA, *Linn. Sp. Pl.* 373.

Usakan Bay, lining the beach in places. Fl. March. 3121.

Distrib. Borneo (B. N. B. Kudat, *Fraser*, Pulo tiga, *Creagh*; Sarawak). Widely distributed.

BAPHIA BORNEENSIS *Oliver in Hook. Ic. Pl.* t. 2456.

Tenom, near the Residency, 700′, along the edge of the sec. forest. Fl. Jan. 3120.

Distrib. Borneo (B. N. B. Sandakan, *Creagh*; Brunei; Sarawak).

"Shrub, 3 m. in height, with white flowers."

CÆSALPINIA NUGA, *Ait. Hort. Kew.* ed. 2. iii. 32.

Usakan Bay, seashore. Fl. March. 4326.

Distrib. Borneo (B. N. B. Sandakan, *Creagh*; Sarawak; D. Borneo). Widely distributed.

CASSIA NODOSA, *Buch.-Ham. ex Roxb. Hort. Beng.* [31]; *Fl. Ind.* ii. 336.

Tenom to Tambunan, 700–2000′, general in sec. forest. Fl. Fr. Jan. 2828.

Distrib. Borneo (D. Borneo). Philippines; tropical Asia.

"A tree, about 26 m., with lovely salmon-pink flowers and pods 15–70 cm. long."

PARKIA ROXBURGHII, *G. Don, Gen. Syst.* ii. 397.

Tenom to Kaningau, 700–1000′, general in sec. forest. Fr. Jan. 3122.

Distrib. Borneo (Sarawak). Malay Peninsula, Java, Philippines; Indo-China and India. Cultivated sparingly.

"A splendid forest tree, 26–38 m. in height, with white trunk and spreading crown, only seen leafless and in fruit. The seeds are valued for colic."

ALBIZZIA MYRIOPHYLLA, *Benth. in Hook. Lond. Journ. Bot.* iii. (1844) 90.

Tenom, 700′, a scrambler, in clearings and in sec. forest, covering large areas. Fl. (yellow) Jan. 2636. Kaningau plain, 1000′, near Station. Fr. 2945.

Distrib. Tropical and sub-tropical Asia.

*PITHECOLOBIUM ANGULATUM, *Benth. in Hook. Lond. Journ. Bot.* iii. (1844) 208.

Kinabalu, Kiau, up to 5000′, in sec. and in high forest. Fl. Fr. Feb. 3973.

Distrib. Malay Peninsula. Tropical Asia.

"A tree 10–20 m. high, with white flowers. Seen from Tambunan to Koung."

PITHECOLOBIUM FASCICULATUM, *Benth. in Hook. Lond. Journ. Bot.* iii. (1844) 208.

Tenom, 700′, general. Fl. Fr. Jan. 2720.

Distrib. Borneo (B. N. B. Ulu Tawaran, *Haviland*; Sarawak). Java, Philippines; India and Ceylon.

"Scandent liane, with orange pod and black seeds, covered with blue wax."

ROSACEÆ.

RUBUS GLOMERATUS, *Blume, Bijdr.* 1111.

Kinabalu, 5000′, Gurulau spur, above Kiau, in high forest. Fl. Fr. Feb. 3989.

Distrib. Borneo (B. N. B. Kiau and Koung, *Burbidge*: Marisinsing, Murudu Bay, *Fraser*: Kinabalu, 6000′, *Haviland*; Sarawak). Malaya.

RUBUS MOLUCCANUS, *Linn. Sp. Pl.* ed. 2. 707.

Tenom, 800′, bridle-path to Melalap, in sec. jungle. Fl. Fr. Jan. 2856.

Distrib. Borneo (B. N. B. Labuan, *Burbidge*; D. Borneo). Malaya, Philippines; Indo-China and India.

Rubus fraxinifolius, *Poir. Encyc.* vi. 242.

Kinabalu, 6000′, slopes above Lobang rock, undergrowth in high forest. Fl. Fr. (young) Feb. 4114.

Distrib. Borneo (B. N. B. Kinabalu, 5000′, *Low*; Kiau, 3000′, *Haviland*). Malay Archipelago, Philippines.

Potentilla leuconota, *D. Don, Prodr. Fl. Nepal.* 230, var. borneensis, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 146.

Kinabalu, 13,000′, granite core, in cracks of granite. Fl. Fr. Feb. 4178.

Distrib. Borneo (B. N. B. Kinabalu, 11,000–13,000′, *Low*, *Haviland*). Of species, Himalayas to Yunnan; New Guinea.

Potentilla Mooniana, *Wight, Ic.* t. 233, var. kinabaluensis, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 146.

Kinabalu, 12,500′, granite core by Kadamaian, in cracks. Fl. Fr. Feb. 4183.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*). Of species, Borneo, Ceylon, Himalayas to Khasia Hills.

Potentilla parvula, *Stapf in Hook. Ic. Pl.* t. 2294.

Kinabalu, 12,000–13,000′, granite core, cracks in granite. Fl. Feb. 4208.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Low*, *Haviland*).

Stranvæsia integrifolia, *Stapf in Hook. Ic. Pl.* 2295.

Kinabalu, 10,000′, Pakapaka cave, banks of Kadamaian torrent, in sheltered forest, abundant. Fl. Feb. 4206.

Distrib. Borneo (B. N. B. Kinabalu, 11,500–13,000′, *Haviland*).

SAXIFRAGACEÆ.

Dichroa febrifuga, *Lour. Fl. Cochinch.* 301.

Between Tambunan and Patau Patau, 2000′, by stream, in sec. forest. Fl. Feb. 3018.

Distrib. Borneo (B. N. B. Tuwaran river, near Bungol, *Burbidge*: Koung, 2000′, *Haviland*; Sarawak). Malay Peninsula, Java, Sumatra, Celebes, New Guinea; Indo-China to Himalayas.

Itea macrophylla, *Wall. in Roxb. Fl. Ind.* ii. 419 (1824).

Kiau, 3000′, on the bridle-path to Koung, in sec. forest. Fl. Feb. 3963.

Distrib. Borneo (B. N. B. Ulu Tuwaran, *Haviland*; Sarawak). Java, Sumatra, Philippines; Indo-China to Eastern Himalayas.

A small tree with green flowers.

Polyosma Hookeri, *Stapf in Hook. Ic. Pl.* t. 2296.

Kinabalu, Pakapaka cave, 10,000′, common in low forest. Fl. Fr. 4263.

Distrib. Borneo (B. N. B. Kinabalu, 8000–10,000′, *Low, Haviland*).

A tree with dingy purple flowers.

Polyosma bracteosum, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 148.

Kinabalu, 10,000′, Pakapaka cave, in low forest. Fl. Feb. 4259.

Distrib. Borneo (B. N. B. Kinabalu, 9000′, *Haviland*).

A tree, common about Pakapaka, with brownish-pink flowers.

DROSERACEÆ.

Drosera Burmannii, *Vahl, Symbol.* iii. 50 (1794).

Jesselton, near the race-course, in a sandy bog by the railway. Fl. Fr. Jan. 2598.

Distrib. Borneo (Labuan, *Motley, Burbidge*; Brunei). Malay Peninsula, Java, Celebes, to N.E. Australia; Japan, Indo-China, and India.

Drosera spathulata, *Labill. Pl. Nov. Holl.* i. 79, t. 106. f. 1.

Kinabalu, 5000′, Maraiparai spur, on serpentine formation, in damp ground. Fl. Feb. 4040.

Distrib. Borneo (B. N. B. Kinabalu, Maraiparai spur, 5500′, *Low, Haviland*). South Japan, China, and Philippines. E. Australia and New Zealand.

HALORAGACEÆ.

Haloragis micrantha, *R. Br. ex Sieb. & Zucc. Fl. Jap. Fam. Nat.* i. 25.

Kinabalu, granite core, cracks in granite, abundant. Fl. Fr. Feb. 4308.

Distrib. Borneo (B. N. B. Kinabalu, 12,000′, *Haviland*). Malay Peninsula and Philippines; Japan, Indo-China and India. Australia and New Zealand.

This locality has been overlooked in Schindler's Monograph of the Haloragaceæ, in the "Pflanzenreich."

RHIZOPHORACEÆ.

Carallia lucida, *Roxb. Corom.* iii. t. 211.

Between Apin Apin and Tambunan, 2000′, in sec. forest. Fl. Feb. 2992.

Distrib. Malay Peninsula, Sumatra; Indo-China to India.

Tree, with dark green, coriaceous, shining leaves and greenish-white, scented flowers. It agrees with Roxburgh's type in the British Museum, distributed from the Calcutta Gardens.

ANISOPHYLLEA TRAPEZOIDALIS, *Baill. Adans.* iii. (1862) 24 & 36.

Jesselton, on open sandstone spurs, scattered. Veg. Jan. 2582.

Distrib. Borneo (Sarawak). Malay Peninsula, Sumatra, Java, Banka, and Philippines.

COMBRETACEÆ.

LUMNITZERA COCCINEA, *Wight et Arn. Prod.* ii. 316.

Labuan, ditches. Fl. March. 3046. Also common at Jesselton, Abai, and Menkabong, on the outside fringe of mangrove-belts.

Distrib. Borneo (Labuan, *Creagh*; Sarawak). Through Malaya, the Pacific Islands, and N.E. Australia. Indo-China and Ceylon; Seychelles.

MYRTACEÆ.

LEPTOSPERMUM RECURVUM, *Hook. f. in Hook. Ic. Pl.* t. 893.

Kinabalu, Pakapaka to top. Fl. 3045. Above and below Pakapaka cave, 10,000′. Fl. 4266. Cracks in granite core to summit, 11,500–13,000′. Fl. Feb. 4200.

Distrib. Borneo (B. N. B. Kinabalu, from 7000′ to top of mountain, *Low*, 11,000–13,000′, *Haviland*).

LEPTOSPERMUM JAVANICUM, *Blume, Bijdr.* 1100, n. 69.

Kinabalu, 7700–11,000′, Kamburangau to sub-summit dwarf forest. Fl. 3044. Kamburangau, a small tree. Fl. Feb. 4147.

Distrib. Borneo (B. N. B. Kinabalu, 7700′, *Haviland*). Malay Peninsula, Sumatra, Java, Celebes; Indo-China.

This tree is very typical on the disintegrated serpentine ridge of the mountain, as the spreading flat-topped habit gives a Japanese effect to the vegetation. It may be described as gregarious, but never massed.

LEPTOSPERMUM JAVANICUM, *Blume, l. c.*, var.?

Kinabalu, 5000–5500′, Maraiparai spur, on serpentine. Fl. Feb. 4049.

A small tree, 10 m. in height. This plant forms a striking intermediate between *L. javanicum* and *L. recurvum*. In habit and pubescence it approaches the former, but in the size of the flowers it agrees with the latter. The leaves may be described as intermediate, showing the small size, obtuse apex, and coriaceous texture of the latter, but they are not reflexed. Neither of these two species has previously been collected on the Maraiparai spur.

BÆCKEA FRUTESCENS, *Linn. Sp. Pl.* 358.

Jesselton, 700′, open sandstone spurs. Fl. Jan. 2577.

Distrib. Borneo (B. N. B. Balambangan Island, *Fraser & Creagh*; Pulo

Bahala, Sandakan Bay, *Ridley*). Malay Peninsula, Sumatra, Java, New Guinea; Japan and Indo-China. Also seen at Patau Patau, at 2000′, in a small patch on the top of the ridge, and on Tambunan plain, at 2000′, forming a dense association in both cases.

DECASPERMUM PANICULATUM, *Kurz in Journ. R. As. Soc. Beng.* xlvi. II. (1877) 61.

Tambunan plain, near Station, 2000′, a shrub in open sec. jungle. Fl. Feb. 3009. Between Koung and Kabayo, 1000′, a tree in sec. forest. Fl. March. 4288.

Distrib. Borneo (B. N. B. Balambangan Island, Kudat, *Fraser*: Bai, *Ridley*; Koung, 2000′, *Haviland*; Sarawak). India to Indo-China, Andamans, Malay Peninsula, Java, Sumatra, Timor, New Guinea.

RHODOMYRTUS TOMENTOSUS, *Wight, Spicil. Neilgherr.* i. 60, t. 71.

Jesselton, common on edge of sec. jungle. Fl. Fr. Jan. 2589.

Distrib. Borneo (B. N. B. Sandakan and Balambangan Island, *Creagh*: Balambangan Island, *Fraser*: Labuan, open jungle, *Burbidge*; Brunei; Sarawak; D. Borneo). Malay Peninsula, Java, Sumatra, Banka, and Philippines; Japan, Indo-China to S. India and Ceylon.

MYRTUS FLAVIDA, *Stapf in Hook. Ic. Pl.* t. 2290.

Kinabalu, 7500–10,000′, Kamburangau to Pakapaka cave. Fl. Feb, 4284.

Distrib. Borneo (B. N. B. Kinabalu, Maraiparai spur, 5500′; Temburengo, 7700′, *Haviland*).

SYZYGIUM CUMINGIANUM, *Gibbs* (comb. nov.).

Eugenia Cumingiana, Vidal, Phan. Cuming. Philipp. 173.

Between Tambunan and Patau Patau, 2500′, in sec. forest. Fl. Fr. (young) Feb. 3021.

Distrib. Borneo (B. N. B. Gaya, *Creagh*). Philippines.

A tree with shining leaves and yellow flowers; the yellow colour was probably due to the stamens being exposed, as the flowers are most minute. On careful comparison with Vidal's description and type at Kew, this plant seems to agree with the above species.

SYZYGIUM ZEYLANICUM, *DC.* iii. 260.

Near Apin Apin, 1500′, clearing in sec. forest. Fl. Feb. 2979.

Distrib. Borneo (B. N. B. Sandakan, *Creagh*; Sarawak). Malay Peninsula, Java; India.

A small tree, about 13 m. in height, with glossy leaves of myrtle-like texture and masses of white flowers.

JAMBOSA RUFO-TOMENTOSA, *Gibbs*, sp. nov.

Arbor. Ramuli teretes, in sicco rugosi, cinerascentes, rufo-pilosi. *Folia* opposita, petiolata, elliptico-oblonga, acuminata, basi cordata, nervis subtus prominentibus fulvo-tomentosis, nervo intramarginali flexuoso conspicuo, supra fulvo-virescentia, subtus pallide ochracea, punctulata, punctis subtus conspicuis. *Paniculæ* cymosæ, terminales vel axillares, paucifloræ, rhachi brevi crassa terete, floribus 5–20 confertis. *Pedicelli* breves, sub calyce articulati, apice bracteolis 2 minutis trigonis instructi. *Alabastrum* elongato-obconicum, paullum turbinatum; lobi 4, rotundi, ampli, imbricati, æquales. *Stylus* elongatus. *Ovarium* biloculare, multiovulatum.

Hab. Apin Apin to Tambunan, 1500–2000′, in open and sec. forest. Fl. Feb. 2990, 3017, *bis.*

The leaves of this plant are dull on the upper surface and lighter underneath in the natural state, and they vary from 5·5 cm. to 2 dm. in length and 2 to 4 cm. in breadth. The inflorescence as a rule is not dense, the small cymes being mostly trichotomously disposed. The entire cyme is 5 cm. long, including the peduncle, which is 2 cm. long, the primary rays being 1 cm. and the secondary 5 cm. in length; the middle flower is sessile in each trichotomous cyme. The calyx narrows down into the pedicel, the tube being 2 cm. long and 7 mm. broad, with lobes 4 mm. in length, concave-rounded, and reflexed in fruit. The large white petals are clawed, with a concave, gland-dotted limb, hairy on the outer surface, about 2 cm. long and 7·8 mm. broad, the claw being 4 mm. in length and 3 m. in breadth. The longest filaments are 2·2 cm. and the anthers 1 mm. long. The style is 3·5 cm. in length.

This plant is conspicuous from the rufous brown tomentum, which clothes the stem, petioles, peduncles, pedicels, and calyx. In this respect it cannot be compared with any known species of *Jambosa.* It has been collected by Haviland in Sarawak (Herb. Mus. Brit., *Haviland*, 992, "small tree, hairs on calyx. White. 5–6 ft. high.").

I found it fairly common in the interior between Apin Apin and Tambunan and also between Tambunan and Korikot, where it grows in the open. The leaves and flowers are smaller and the latter denser and more aggregated, with lateral cymes in the axils of the leaves immediately subtending the terminal cyme, while the rufous hairs are not so long or thick. That is the case with most of the following numbers of Haviland's at Kew, which are apparently referable to this species, viz., 970 (calyx pink, petals and stamens white); 3380; 992 (hairs on calyx red or pale, 10 ft. tall); 1698. In the forest this species is semi-scandent, as is so often the case with tropical plants, sending long flexible branches through the surrounding foliage, and its cymes have fewer and larger flowers. This state is shown in my no. 3017, which consists only of a few flowers and buds put up in

formalin, but Haviland's no. 992 is a perfect example of the forest form, the hairs being very long and the leaves much larger than in any of my specimens.

MELASTOMACEÆ. (O. Stapf and Miss M. L. Green.)

Blastus Cogniauxii, *Stapf in Hook. Ic. Pl.* t. 2311 *& in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 154.

Kinabalu, above Lobang rock, 6000′, in high forest. Fl. Feb. 4119.

Distrib. Borneo (B. N. B. Kinabalu, Penokok, 4000–6000′, *Haviland*; Sarawak).

"A tree with white flowers."

Anerincleistus Beccarii, *Cogn. in DC. Mon. Phanerog.* vol. vii. (*Melast.*) 478.

Sarawak, Mt. Matang, 2000′, in high forest. Fl. March. 4425.

Distrib. Borneo (Sarawak).

Sonerila tenuifolia, *Blume in Flora*, xiv. (1831) p. 491.

Kinabalu, Maraiparai spur, 4000–4500′, in forest undergrowth. Fl. Feb. 4068.

Distrib. Borneo (B. N. B. Kinabalu, Penokok, 6000′, *Low*; 3500′, *Haviland*; D. Borneo). Malaya from Sumatra and Malacca to Borneo.

Sonerila crassiuscula, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 156.

Kinabalu, between Kamburangau and Pakapaka, in mossy forest. Fl. Feb. 4223.

Distrib. Borneo (B. N. B. Kinabalu, 9000′, *Burbidge*, *Haviland*).

"Underside of leaves purple."

Sonerila pulchella, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 157.

Kinabalu, slopes above Lobang rock, 6000′, in high forest. Fl. Feb. 4121.

Distrib. Borneo (B. N. B. Kinabalu, *Burbidge*; Penokok, 3500′, *Haviland*).

When describing this species I compared it with *S. picta*, Griff., and observed that it differed from it solely in the shape of the leaves. I added, however, that I had seen only a single anther, and this was broken in the middle. Miss Gibbs's specimens possess well-preserved anthers. They are 1·5 mm. long, ovate-oblong and obtuse, and therefore rather different from those of *S. picta*, so that the similarity of the two species is, after all, not so great. I would also add that both her specimens have non-variegated leaves, as has one of Haviland's.—O. S.

SONERILA MACULATA, *Roxb.*, var. GLABRATA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 157.

Between Apin Apin and Tambunan, 2000′, carpeting in secondary jungle, 1·3 dm. high. Fl. Feb. 2985.

Distrib. Borneo (B. N. B. Kinabalu, 6000′, *Haviland*).

PHYLLAGATHIS ELLIPTICA, *Stapf in Hook. Ic. Pl.* t. 2279 *& in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 128.

Kinabalu, Kiau, on the Gurulau spur, 5500′, in high-forest undergrowth. Fl. Feb. 4422.

Distrib. Borneo (B. N. B. Kinabalu, 4000–5000′, *Low, Haviland*).

MARUMIA PACHYGYNA, *Korth. Verh. Nat. Gesch. Bot.* 242, t. 59.

Sarawak, Mt. Matang, 1000′, near Kuching, in a clearing by "Vallombrosa." Fl. March. 4424.

Distrib. Borneo (B. N. B. Kinabalu, 3000′, Penokok, *Haviland* ; Sarawak; D. Borneo).

Miss Gibbs describes the flowers as "lovely white," which agrees with Haviland's statement, whilst Korthals figures them pink.

DISSOCHÆTA RUBIGINOSA, *Stapf*, sp. nov.; affinis *D. intermediæ*, Bl., sed foliis firmioribus, indumento magis rudi, inflorescentiæ ramis ramulisque robustioribus brevioribusque, antheris sursum minus attenuatis appendicibus anticis brevioribus distincta; etiam *D. celebicæ* comparanda, sed floribus majoribus et antheris magis elongatis recedens.

Frutex scandens, ramis teretibus, junioribus ut foliorum pagina inferiore paniculis calycibusque rufo-stellato-furfuraceo-tomentosis. *Folia* oblonga, basi rotundata, apice in acumen lineare plerumque obtusum sensim vel subito attenuata, 7–8 cm. longa, 3–4 cm. lata, supra saturate viridia, subtus rufa, subcoriacea, 5-nervia, nervis venisque transversis subtus prominentibus; petiolus 7–10 mm. longus. *Panicula* pyramidalis, densiuscula, 7–10 cm. longa, basi 6–8 cm. lata; pedicelli 1–4 mm. longi. *Calyx* anguste campanulatus, cum limbo latiusculo obscure late-lobato 5 mm. longus. *Petala* rosea, ovata, obtusiuscula, 6 mm. longa (in alabastris maturis). *Stamina* 4; antheræ basifixæ, lanceolatæ, apice obtusiusculæ, in alabastro 4 mm. longæ, appendicibus anticis setiformibus, appendice postico triangulari, 1 mm. longo. *Stylus* 9 mm. longus. Fructus ovoideo-globosus, 7 mm. longus, demum glabrescens.—*D. intermedia*, Cogn. in DC. Mon. Phan. vii. (Melastom.), 562, in parte, non Bl.; *Melastoma rubiginosum*, Wall. Cat. n. 4052 in parte.

Kinabalu, Gurulau spur, in high forest, 3500′; no. 3977.

Nearly the whole of Wallich's *Melastoma rubiginosum* from Penang (no. 4052) belongs to this species, as also a specimen collected by Helfer

in Tenasserim (14.I.1839) and distributed under no. 2286. A *Dissochæta* collected by Haviland on Mt. Matang, Sarawak, at 750 m. is also referable to *D. rubiginosa*. None of these specimens have fully developed open flowers. Hence the dimensions given are liable to correction.

DISSOCHÆTA MACROSEPALA, *Stapf*, sp. nov.; ob calycis lobos lineari-oblongos 3–4 mm. longos persistentes insignis, an sectioni *Dissochætopsi* adnumeranda?

Frutex vage scandens, ramis teretibus, junioribus ut foliorum pagina inferiore paniculis calycibusque rufo-stellato-furfuraceis. *Folia* ovata, basi breviter cordata, subito in acumen tenue 5–6 mm. longum contracta, acumine interdum reflexo, circiter 6 cm. longa, 3–3·5 cm. lata, coriacea, subtus rufa, 5–7-nervia, nervis venisque supra immersis subtus prominentibus; petiolus circiter 0·5 cm. longus. *Panicula* 12 cm. longa vel longior et ramis e foliorum summorum axillis aucta, basi 12–14 cm. lata, laxa; pedicelli 3–4 mm. vel cum ramulo subtendente ad 12 mm. longi. *Calyx* campanulatus; tubus 5–6 mm. longus; limbus alte 4-lobus, lobis lineari-oblongis obtusiusculis post anthesin paulo auctis patulis persistentibus ad 4·5 mm. longis. *Petala* rosea, late ovata, apiculata, 5–6 mm. longa. *Stamina* 4; filamenta 5–6 mm. longa; antheræ basifixæ, subulatæ, connectivo basi producto, antice appendicibus 2 setiformibus vix 1 mm. longis instructæ, postice breviter calcaratæ, calcare subquadrato. *Stylus* 8 mm. longus. *Fructus* ignotus.

Hab. Ridge above Bundu Tuhan, 3000′, in secondary jungle. Fl. Feb. 3951.

Technically this might, but for the persistent calyx-segments, be referred to the section *Dissochætopsis*; but I have not seen a specimen of *D. Schumannii*, the only species, of which it consists.

*MEDINILLA SPECIOSA, *Blume in Flora*, 515 (1831).

Kinabalu, Tenumpok ridge, 1000–2000′, Kadamaian river, in secondary jungle. Fl. Feb. 4320.

Distrib. Malay Peninsula, Java, Sumatra, and Moluccas.

ASTRONIA SMILACIFOLIA, *Triana, Melastom. in Trans. Linn. Soc., Bot.* xxviii. (1871) 152.

Mensangau, 2000′, in secondary forest, a tree with white flowers. Fl. Feb. 3035.

Distrib. So far only known from the Malay Peninsula and Penang.

PTERNANDRA CÆRULESCENS, *Jack in Malay. Misc.* ii. No. vii. 61 (1822).

Kotabelud, 500′, on sandstone hills in open forest. Fl. March. 4342.

Distrib. Malay Peninsula.

"A tree, 18 m. high, with blue flowers."

We also refer to this species the following numbers of Beccari's Borneo

collection, 3141, 3275, 3363, and Haviland's 543 and 2203 from Kuching. Beccari, 1962, may represent another species, whilst his 700 and 3768 *bis* have not been seen by us. All of Beccari's specimens quoted here are enumerated under *P. capitellata*, Jack, in Cogniaux's 'Monograph of the Melastomaceæ,' but *P. capitellata*, Jack, is an obscure plant. Jack himself never published a description of it, and Wallich marked his 4079 when he distributed it under that name with a sign of interrogation. The plant represented by 4079 in Wallich's herbarium is a very large-leaved species, which we know only from the Malay Peninsula (Wallich, 4079; Maingay, 1568; King, 4th March, 1879; King's coll., 4856; Helfer, 2279; Curtis, Penang, 67; Scortechini, 43). It also includes, at least in part, Naudin's *P. medinilliformis*. Of the remaining specimens, quoted by Cogniaux under *P. capitellata*, Teijsmann's plant from the island of Bangka was described as *Ewyckia Korthalsiana* by Miquel, and referred to *Pternandra* as *P. Korthalsiana* by Triana. It is distinct from the large-leaved *P. capitellata* of Wallich. In a similar way *P. cærulescens* of Cogniaux seems to be a composite species. *P. cærulescens* was well described by Jack, and is in our opinion easily recognised in a specimen in Herb. Hooker from Penang, marked "nov. genus Roxb.," which agrees very well with the Bornean specimens quoted above. Wallich's and Griffith's specimens quoted by Cogniaux under the "type," are, as far as the Kew material goes, also referable to *P. cærulescens*. The varieties *β. Jackiana* and *γ. cyanea*, however, seem to deserve specific rank.

KIBESSIA TESSELLATA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 162.

Kinabalu, Kiau, 2700′, on the bridle-path to Koung, in secondary jungle. Fl. Feb. 3969.

Distrib. Borneo (B. N. B. Kinabalu, Koung, on the Tampussuk river, 2000′, *Haviland*).

"A tree 11 m. high, with light mauve corollas."

MEMECYLON LANCEOLATUM, *Cogn. in DC. Monogr. Phan.* vii. 1157? *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 162.

Rayoh hills, Tenom, 1500′, in primary high forest. Fl. Jan. 2898.

Distrib. Borneo (B. N. B. Kinabalu, 6000′, *Haviland*).

"A tree with bluish-white flowers, 17 m. in height." This is apparently the plant, enumerated by me *l. c.*, with some reserve, under *M. lanceolatum*. Unfortunately the material is too scanty to solve the question as to its taxonomic status.—O. S.

ONAGRACEÆ.

Jussieua linifolia, *Vahl, Eclog. Am.* ii. 32.
Tenom, 700′, in an open ditch. Fl. Jan. 2671.
Distrib. Philippines, Christmas Island. Tropical Asia and America.

Jussieua suffruticosa, *Linn. Sp. Pl.* 388.
Tenom, 700′, in open ditch by path. Fl. Fr. Jan. 2670.
Distrib. Borneo (Sarawak ; D. Borneo). General in the tropics.

Jussieua repens, *Linn. Sp. Pl.* 388.
Tenggilan, 500′, in open marsh. Fl. March. 4341.
Distrib. Borneo (D. Borneo). General in the tropics.
In the above plant the flowers were white.

CUCURBITACEÆ.

Gymnopetalum cochinchinense, *Kurz in Journ. R. As. Soc. Beng.* xl. pt. ii. (1871) 57.
Tenom, 700′, common in open places near cultivation. ♀. Jan. 2623.
Distrib. Borneo (Sarawak ; D. Borneo). Malay Peninsula, Java, Celebes, Philippines ; Indo-China to India.

Thladiantha cordifolia, *Cogn. in DC. Mon. Phan.* iii. 424.
Tenom, 700′, in clearings, creeping over everything. ♂. Fr. Jan. 2631.
Distrib. Java, Sumatra.

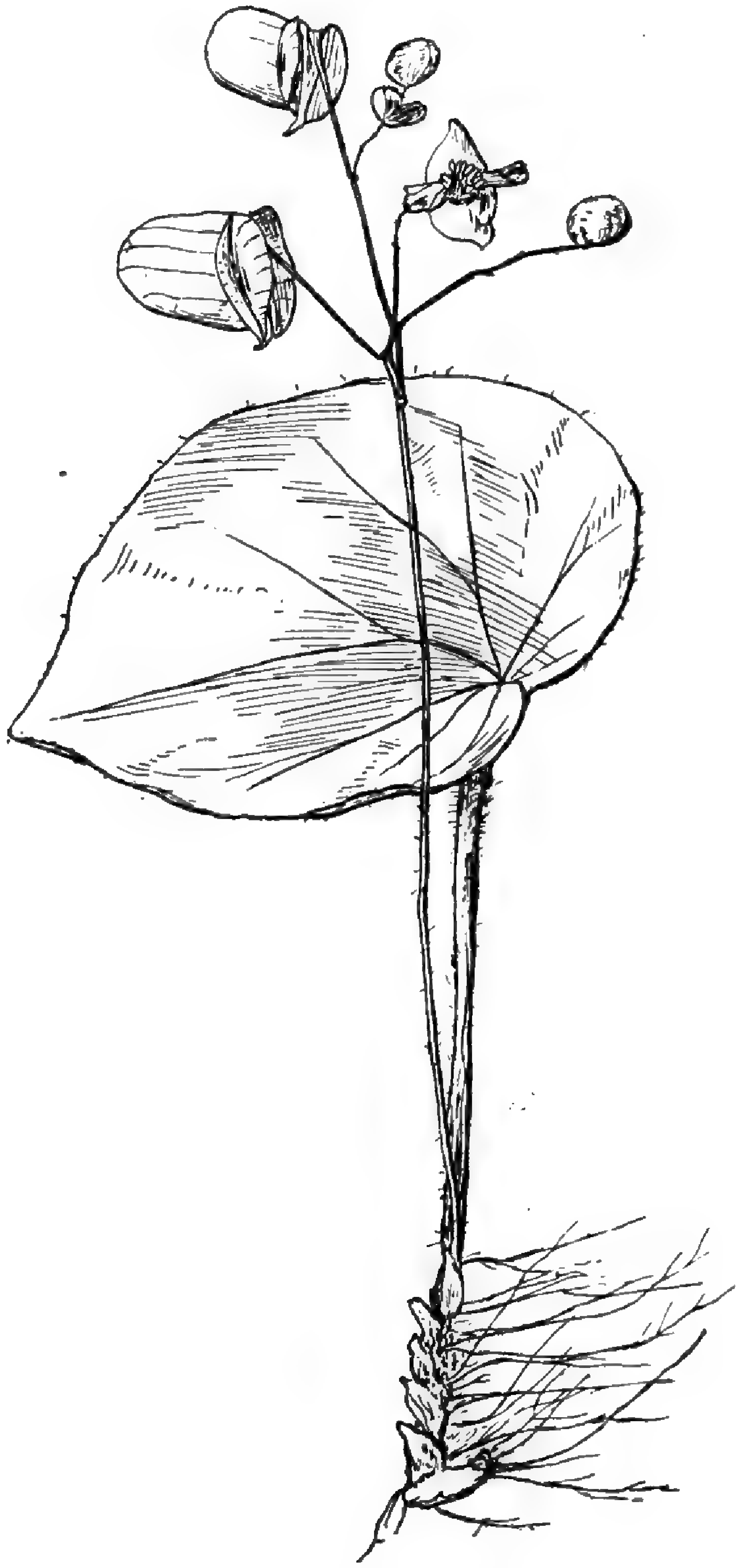
BEGONIACEÆ.

Begonia sp.
Koung, 1000′, undergrowth in sec. forest. Fr. Feb. 4313.
This little plant belongs to § *Reichenheimia*, and shows a creeping rhizome, with flatly spreading radical leaves. It was unknown to Mr. H. N. Ridley, who kindly looked at the specimen for me, and it does not seem to match any species represented at the British Museum or at Kew. As the specimen showed only the persistent scales of the ♂ flowers, which are pink in colour, orbicular in outline and gland-ciliate, and two capsules, it is not possible to describe it satisfactorily.

Begonia (§ Reichenheimia) Gueritziana, *Gibbs*, sp. nov.
Rhizoma subterraneum, oblique cylindraceum, radicibus onustum, supra stipulaceo-squamosum. *Folia* palmata, 6–7-nervia, inæqualiter late ovato-acuta, cordata, lobis superpositis, firma, membranacea, margine undulato-

ciliata, supra glaberrima, subtus in nervis adpresse rufo-furfuracea, pilosiuscula, pallidiora, petiolo fusco-villoso, stipulis a basi lanceolatis onge subulatis

Fig. 2.



Begonia Gueritziana, Gibbs.

pauce ciliatis. *Flos* ♂ : foliola exteriora 2 orbicularia, acuminata, interiora 2 lanceolato-spathulata, petaloidea. *Stamina* ∞, filamentis ad basin monadelphis. *Fructus* capsularis inæqualiter 3-alatus.

Hab. Tenom, hills above, 1300′, in the undergrowth in high forest. ♂ and Fr. Jan. 2892.

In this plant the radical leaves are tufted, one leaf showing the petiole 6 mm. long, with the blade 8·3 cm. across and 5·5 cm. high; the texture is firm, and the upper surface very conspicuously pitted. The stipules are 2 cm. long, the subulate point half the length. The peduncle is 11 cm. long, fuscous at the base and glabrous towards the apex, where it dichotomises once, each branch showing a capsule and ♂ flowers. The bracts of the ♂ flower are entire and pink in colour, the sepals 6 mm. across and 7 mm. long, the petals, with wrinkled margins, 4 mm. and 5 mm. long respectively. The filaments of the stamens are free, only joined at the base, 1 mm. long, with anthers 2·2 mm. long. The capsules are green in colour, therefore possibly not mature, with three very obtuse lobes, the median lobe about 11 mm. long, nearly twice as long as the lateral lobes, which are 5 mm. across.

This species is very near *B. mollis*, A. DC., in its vegetative parts, but differs in the leaves being firmer and showing larger pits, with the tertiary veins not in evidence, in the entire, non gland-ciliate, bracts of the ♂ flowers, and in the texture and shape of the capsule with its obtuse, unequal lobes.

This plant has been named in honour of His Excellency H. P. Gueritz, to whom I was indebted for much hospitality and kindness during my stay in British North Borneo.

Begonia adenostegia, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 164.

Tenumpok ridge, between Bundu Tuhan and Kiau, 5000′, in the undergrowth of the primary high forest. Fl. ♂. Feb. 3948.

Distrib. Borneo (B. N. B. Kinabalu, Kinitaki river, 4500′, *Haviland*).

Begonia Burbidgei, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 165.

Kinabalu, slopes above Lobang, 6000′. ♂ ♀. Fr. Feb. 4124.

Distrib. Borneo (B. N. B. Kinabalu, above Kiau, *Burbidge*: at 7600′, *Haviland*).

A handsome species, up to 2 m. high, with pink flowers, very characteristic of the undergrowth in the primary forest which clothes the slopes above Lobang rock.

Begonia borneensis, *A. DC. Prod.* xv. part i. 320.

Old Tenom, 1200′, undergrowth in sec. forest. ♂. Fr. Jan. 2927.

Distrib. Borneo (B. N. B. Kinabalu, 6000′, *Haviland*; Labuan, *Motley*; Sarawak; D. Borneo).

A fine species, 1 m. high, with green leaves splashed with red on

the underside, and pink flowers. In the above specimen the capsules are rather larger than in the type.

BEGONIA PUBESCENS, *Ridl.* var., *Journ. R. As. Soc. Straits Br.* No. 46 (1906) 254.

Tenom, Rayoh hills, 1300′, undergrowth in high forest. ♂. Jan. 2874.

Distrib. Borneo (Sarawak (of type)).

Plant 70 in. high, with green leaves, reddish on the undersides, and white flowers with a pink sheen.

I am indebted to Mr. H. N. Ridley for this determination.

UMBELLIFERÆ.

HYDROCOTYLE JAVANICA, *Thunb. Diss. Hydroc.* n. 17, t. 2.

Mensangau, 2500′, undergrowth in sec. forest. Fr. Feb. 3038.

Distrib. Borneo (B. N. B. Kinabalu, bed of the Dahobang, 3000′, *Haviland*; Sarawak ; D. Borneo). Malay Peninsula, Java, Sumatra, Philippines. Japan and China; Indo-China to India.

DIDISCUS SANICULÆFOLIUS, *Merrill in Philipp. Journ. Sci. Bot.* ii. (1907) 292.

Syn. *Trachymene saniculæfolia*, Stapf in Hook. Ic. Pl. 24, t. 2308.

1. Var. TYPICUS, *Domin in Sitz. Kön. böhm. Ges. d. Wiss.*, ii. *Cl.* 66 (1908).

(α) f. *glaber*.

Kinabalu, damp places from Kamburangau to Pakapaka, 8000′, undergrowth. Fr. 4221.

(β) f. *hirsutus*.

Kamburangau, 7500′, creeping amongst dense *Patersonia* growth, in an open shallow sand-pan. Fl. Fr. 4150.

2. Var. RUPICOLA, *Domin, loc. cit.*

Summit, 13,000′, cracks in granite. Fl. (pink). 4184, 4310 *bis*.

Distrib. Borneo (B. N. B. Kinabalu, 7000–11,000′, *Low*; 8000′, *Whitehead*; Temburungo (= Kamburangau), 7000′, *Haviland* ; 13,000′ to top, *Haviland*). Philippines and New Guinea.

Var. TYPICUS β. f. *hirsutus* is found at Kamburangau on a small open pan of shallow sand, which carries an association of *Patersonia* and sedges, about 1 m. high. This growth draws up the aerial shoots of the *Didiscus* to ± 50 cm., the stolons running through it. Whitehead and Haviland both collected this form in the same locality, but Burbidge has a very small tufted specimen from 10,000′ (forma *minor* Domin).

Var. TYPICUS α. f. *glaber* is quite glabrous with the exception of a few hairs at the base of the petiole, and tufted and much smaller, but the leaves

show similar shape and venation ; I found it growing in damp places from 7000′. A plant of Low's, approximating in size and strength of stolons, is marked 7000–11,000′, and that specimen is the one figured by Stapf (Ic. Pl. t. 2308).

Var. RUPICOLA is the typical form of the granite core, where it was first collected by Haviland. Stapf, relying on Haviland's locality (summit), considers this as a stunted form, to be put down to the conditions of such an exposed habitat. In my specimens the only difference is in the length of the peduncle, which barely rises above the leaves in the extreme summit plants, whereas in those from 7000′ (No. 4221) it is as long again. The glabrous habit is therefore more likely due to damp conditions, as I noted the plant on clay soil or where water had accumulated. The typical tufted hairy *β*. f. *hirsutus* (f. *minor*) has been collected on Mt. Halco, Mindoro, by Merrill.

ARALIACEÆ.

*ARALIA FEROX, *Miq. Fl. Ind. Bat.* i. pt. I. 750.

Between Koung and Kabayo, 1000′, in sec. forest. Fl. Fr. (young), Feb. 4294.

Distrib. Java. Malay Peninsula.

Shrub, about 6·5 m. high ; the huge pinnate and armed leaves are aggregated towards the ends of the branches, the uppermost of which bear in their axils handsome spreading panicles 0·75 m. long, with white flowers and an armed rhachis.

CORNACEÆ.

* ? MASTIXIA TRICHOTOMA, *Blume, Bijdr.* 655 *& Mus. Bot. Lugd.-Bat.* i. 257, fig. 58.

Kinabalu, Gurulau spur, 5500′, in high forest. Buds. Fr. (young), Feb. 3982.

Distrib. (of species). Java.

A tree, with white flowers and fruit, but both being immature, this determination is necessarily uncertain.

CAPRIFOLIACEÆ.

*VIBURNUM (§ Eu-Viburnum) VERNICOSUM, *Gibbs*, sp. nov.

Arbor. Ramuli teretes, glabri. *Folia* longe petiolata, obovata, obtusa, vel in acumen parvum abrupte producta, basi acuta, integra, coriacea, glabra, supra in sicco fulvo-virescentia, subtus pallide ochracea, utrinque rufo-punctulata, nervis lateralibus 6–8 arrectis prope marginem evanescentibus subtus valde prominentibus supra leviter insculptis, venis transversis horizontalibus

conspicuis. *Corymbi* terminales, pedunculati, umbellati, radiis primariis 6–7; cymularum flores 1–4, sessiles basi, bi-bracteolati. *Flores* magni. *Calycis* tubus turbinatus, dense lepidotus, vernicosus; limbus 5-denticulatus. *Corolla* membranacea, in alabastro teres, expansa tubularis, limbi lobis acutis erectis in alabastro imbricatis. *Antheræ* elongatæ, exsertæ versatiles, filamentis elongatis basi corollæ affixis subulatis glabris. *Stylus* brevissimus, conicus, 3-partitus; ovarium imperfecte biloculare, uni-ovulatum. *Drupæ* ovoideæ, compressæ, stylo brevi et calycis dentibus coronatæ, endocarpio tenui compresso, hinc bisulcato, illinc uno-bisulcato. *Semen* putamini conforme, testa crassa, endospermo carnoso uniformi.

Hab. Above Kiau, 3500′, in sec. forest. Fl. Fr. Feb. 3990.

The upper surface of the leaves is very shining in the dried state. The petioles are 2 cm. long and the leaves 12 cm. long and 6·5 cm. broad. The panicle rises well above the leaves, the primary rays of the inflorescence are 4 cm. while the secondary are 2 and the tertiary 1 cm. in length. The flowers are shortly pedicellate, each with 2 bracteoles, 4 mm. long; the calyx is 1·5 mm. long, obscurely lobed; the corolla is gland-punctate, 5 mm. long and lobed half-way down, the lobes being acute; the stamens are long, exserted, the filaments being 2 cm., while the versatile anthers are 2 mm. long. The fruit is 1 cm. long and 8 mm. broad, the ultimate rays of the umbel being limited to three in the specimen, each bearing only one fruit. All the parts are very vernicose, especially in the case of the flowering umbel.

This species seems to be referable to the *Lantana* sub-section of *Eu-Viburnum*, and is nearest to *V. coriaceum*, Blume, but it differs in the larger and entire leaves, with smaller acumen, and the non-arcuate, less prominent secondary veins, in the inflorescence being longer than the leaves, and in the long exserted anthers. The fruit is also larger.

*SAMBUCUS JAVANICA, *Reinw. ex Blume*, *Bijdr.* 657.

Kinabalu, in Lobang stream, by rock, 5000′, in high forest, gregarious. Fl. Feb. 4129.

Distrib. Java, Sumatra, and Philippines. Japan, Indo-China to India.

RUBIACEÆ. (H. F. WERNHAM.)

ANTHOCEPHALUS MACROPHYLLUS, *Haviland in Journ. Linn. Soc., Bot.* xxxiii. (1897) 23.

Tenom, 700′, general epiphyte in sec. forest. Fl. Jan. 2822.

Distrib. Borneo (Sarawak). Eastern India.

NAUCLEA CYRTOPODIOIDES, *Wernham*, sp. nov.

Arbor ramulis robustis; *foliis* coriaceis inter maxima, late ellipticis basi

subcordatis, utrinque in venis ipsis glaberrimis, venis subtus valde prominentibus supra impressis, petiolo valido longiusculo ; *pedunculis* 1–3 complanatis, bracteis prope apicem caducissimis ; *capitulis* majusculis ; *calycis* loborum partibus caducis manifeste clavatis apice flavis veluti partes persistentes truncatæ cano-sericeis ; *corollæ* lobis extus puberulis ; *antheris* linearibus minute apiculatis, nec usque ad summum tubum pervenientibus.

Hab. Melalap, 800′, banks of Pengallan river, in sec. forest. Fl. Jan. 2758.

A tree, 13 m. in height, with white flowers, and leaves attaining over 37 cm. × 11 cm. Secondary nerves 12–14 pairs ; petiole 6–9 cm. long. Peduncle 10 cm. long, with bracts inserted scarcely 1 cm. below the head. Capitula, without the corollas, 3 cm. × 1·8 cm. Corolla-tube 12 mm., lobes 5 mm. Style 28 mm. Caducous part of calyx 5 mm. long, persistent part 2·5 mm.

Near *N. cyrtopoda*, Miq., but distinct in its larger leaves with quite glabrous veins, in the calyx, and in the pubescent corolla-lobes.

WENDLANDIA PANICULATA, *DC. Prodr.* iv. 411.

Between Patau Patau and Korikut, 2000′, liane in sec. forest. Fl. Feb. 3020.

Distrib. Borneo (B. N. B. Ulu Tuwaran, 2000′, and in young jungle, Kiau, 3000′, *Haviland*). Java, Moluccas, Amboina. Indo-China to N. India.

*ARGOSTEMMA KINABALUENSE, *Wernham*, sp. nov.

Herba caule insuper dense tomentoso ; *foliis* oppositis inæqualibus lanceolatis vel obovatis utrinque angustatis supra hispido-pilosis subtus canescentibus discoloribus præcipue in venis prominentibus villosis, petiolo brevi dense villoso ; *stipulis* ovatis extus glabratis vel sparse pubescentibus colore diluto nonnunquam fere cano ; *inflorescentia* 3–5-flora umbellata pedunculo ut pedicelli longiusculi in fructu accrescentes dense tomentoso ; *bracteis* stipulis similibus nisi minoribus ; *floribus* 5-meris minusculis ; *calyce* extus nisi lobis ovatis subacutis sparsiuscule pilosis dense villoso ; *corolla* alba ad medium lobata extus sparse hirtella ; *bacca* oblonga ut pedicellus jam pedunculum multo excedens dense villosa, calycis limbo persistente coronata.

Hab. Kinabalu : Penibukan ridge, between Dahobang and Kinitaki rivers, 4000–5000′, in high forest undergrowth. Fl. Fr. Feb. 4056.

A herb, 2 dm. high, with hispidulous leaves ; the larger, 4–5 cm. × 1·5–2 cm. with petioles about 3 mm. long, the smaller not more than 2 cm. × 0·7 cm. ; lateral veins 10–12 pairs ; stipules 5–7 mm. × 4 mm. Peduncle up to 1·7 cm. ; flowering pedicels 7 mm., attaining about 2 cm. in the fruiting stage. Calyx (including ovary) 4 mm. long, corolla 7 mm., including the ovate lobes 3·5 mm. long. Berry 5 mm. long, with calyx-lobes 4 mm. long.

Allied to *A. boragineum*, Blume, but readily distinguishable by the leaves and the calyx.

*ARGOSTEMMA HAMELLIÆFOLIUM, *Wernham*, sp. nov.

Herba nisi inflorescentia glabra ; *caule* siccitate complanato ; *foliis* majusculis plus minus anguste ellipticis utrinque angustatis acuminatis petiolatis æqualibus subtus discoloribus venis primariis conspicuis; *stipulis* oblongis majusculis ; *cyma* multiflora densiuscula, pedunculo glabrato, ramis et pedicellis minute ferrugineo-puberulis ; *floribus* pedicellis brevioribus; *calyce* campanulato extus ferrugineo-pubescente dentibus ovatis obtusis brevibus ; *corolla* alba extus glabrata fere ad basin in 5 lacinias lanceolatas divisa.

Hab. Kinabalu, before Lobang rock, 5000′, in high forest. Fl. Feb. 4101.

A herb 0·75 to 1 m. high, with leaves about 16 cm. × 5 cm. ; petiole 1 cm., or less ; secondary nerves about 13 pairs ; stipules 14 mm. × 4 mm. Peduncle 3·5 cm. ; inflorescence 3–4 cm. in diameter ; pedicels 6–8 mm. Flower-buds lanceolate, about 7 mm. long ; calyx 3 mm., teeth less than 1 mm. long ; corolla-lobes 4 mm. long.

The nearest affinity seems to be *A. subcrassum*, King, the main distinction being the inequality of the leaves and larger flowers in that species.

HEDYOTIS VESTITA, *R. Br. in Wall. Cat.* n. 847 (1830).

Tenom, 800′, clearing by the old Residency. Fl. Jan. 2865.

Distrib. Borneo. Widely distributed in Malaya, India, and the Himalayan region.

"A prostrate spreading herb, with mauve flowers."

HEDYOTIS PROTRUSA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 169.

Kinabalu, Maraiparai spur, 5500′, in bog. Fl. Feb. 4066.

Distrib. Borneo (B. N. B. Kinabalu, Maraiparai spur, 5500′, *Haviland*).

"Woody, 0·25 to 0·75 m. high, with white flowers."

HEDYOTIS PULCHELLA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 169.

Kinabalu, from below Lobang to above Pakapaka, undergrowth in high forest and open scrub, 4000–12,000′. Fl. & Fr. Feb. 4127.

Distrib. Borneo (B. N. B. Kinabalu, 7000–9000′, *Haviland*).

"A shrub, 1–1·5 m. high, with white flowers."

*HEDYOTIS PULCHELLA, *Stapf, loc. cit.*, var. MAGNISTIPULA, *Wernham*, var. nov. Stipulis magnis 16 mm. × 9 mm. attingentibus.

Kinabalu, Maraiparai and Gurulau spurs, 5500′, undergrowth in high and mossy forest. Fl. Feb. 4047.

"In herbaceous undergrowth, 0·75 to 1 m., with white flowers." Very

distinct in its large leathery grey stipules, but scarcely a separate species. The calyx-lobes are somewhat more rigid, broader, and shorter than in the type.

HEDYOTIS MACROSTEGIA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 170.

Kinabalu, from Pakapaka almost to the summit, 10,000–13,200′, in scrubby forest and cracks in the granite core. Fl. Feb. 4187.

Distrib. Borneo (B. N. B. Kinabalu, 8000–12,000′, *Low, Haviland*).

Undershrub, prostrate up to 0·75 m. high, with white flowers.

PHYLLOCRATER, *Wernham*, gen. nov.

Calycis tubus obconicus, bractearum vel stipularum connatoram 4 vel plurium dissimilium involucro cinctus a quo internodio brevissimo separatus; limbi lobi 4, lanceolati, ampli, subrigidi, vena media forti, cum dentibus subfiliformibus alternantes. *Corolla* campanulata, tubo gracili longiusculo fauce glabrescente; limbi lobi 4, intus dense villosi, valvati. *Stamina* 4 fauci corollæ inserta, filamentis pro rata longis; antheræ dorso affixæ, exsertæ. *Discus* parvus. *Ovarium* 2-loculare; stylus gracilis, stigmate lobis 2 parvis rotundatis latis obtusis; ovula in loculis numerosa, placentis septo medio affixis inserta. *Capsula* parva, venosa, turbinata, a vertice loculicide dehiscens, calycis segmentis erectis subfoliaceis persistentibus coronata bractearumque involucro cincta. *Semina* angulata, foveolata.—Herbæ vel suffrutices rigidi, repentes, foliis oppositis, stipulis setaceo-fimbriatis. Flores majusculi, axillares, solitarii, albi.

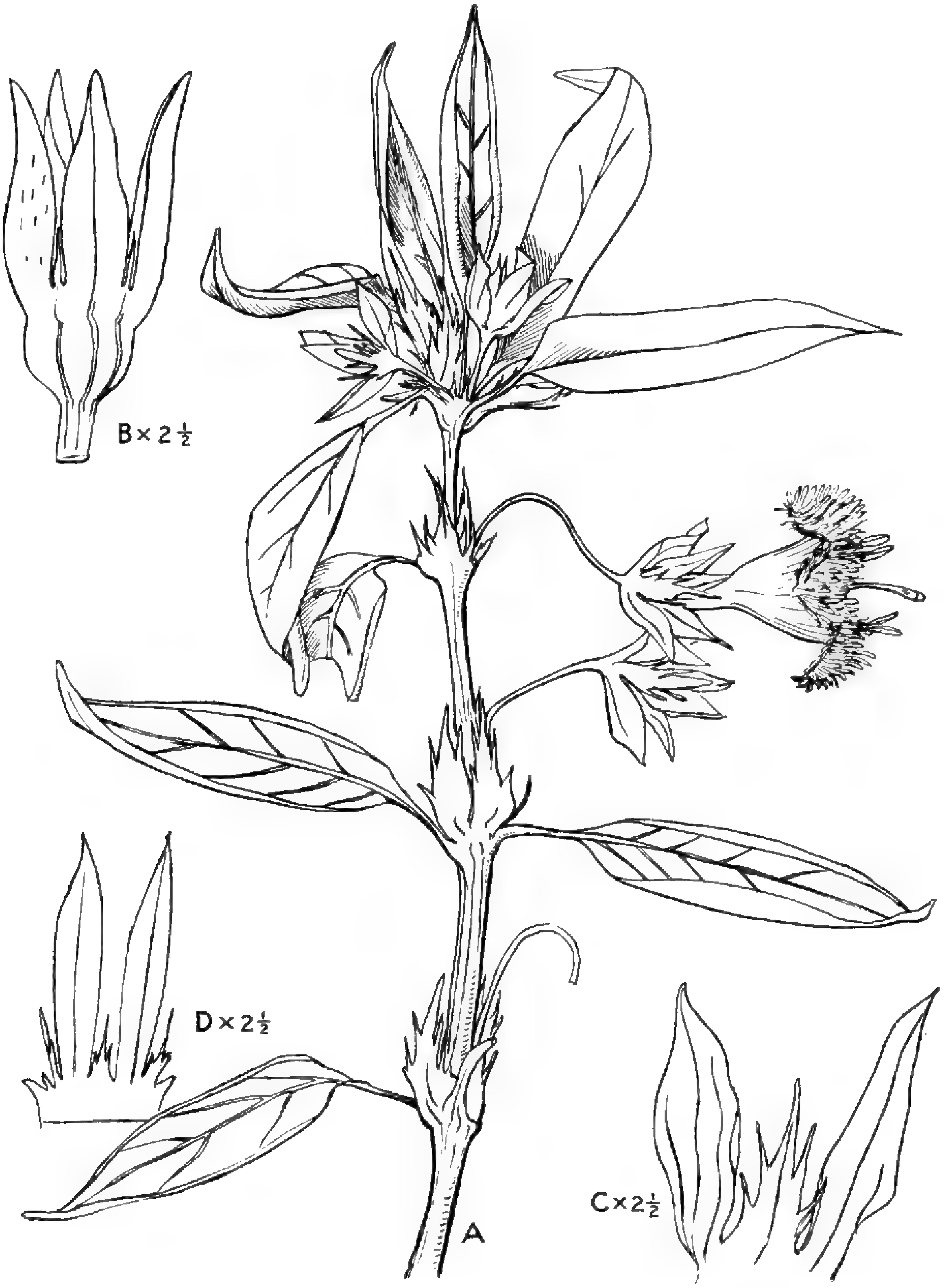
The habit, æstivation of the corolla, and character of the ovary and fruit, leave no doubt that this genus should be classed with the Hedyotideæ. It is distinct as a genus in virtue of the relatively large size of the solitary axillary flowers, and of the very definite involucre of bract-like organs associated with the calyx and fruit. The habit is much like that of one of the coarser *Hedyotes*; but the conspicuous scales alternating with the calyx-lobes distinguish this plant readily from that genus.

*PHYLLOCRATER GIBBSIÆ, *Wernham.*

Suffrutex glaber, ramulis compressis; *foliis* petiolatis angustis lanceolatis subcoriaceis venis paucis sed valde conspicuis marginibus revolutis; *stipulis* ovatis acuminatis canis membranaceis marginibus setaceis persistentibus; *floribus* longe et gracillime pedicellatis; *calyce* cum bractearum involucro corollæ partem campanulatam subæquante nec vix ejus tubum pro rata tenuem excedente, floris ore pilis corollæ loborum quasi occluso; *antheris* subtortis parum exsertis parvis ellipticis; *stylo* filiformi striato glabro longiuscule exserto; *capsula* costata.

Hab. Kinabalu, cracks in granite, at summit, 13,200′. Fl. Feb. 4307.

Fig. 3.



Phyllocrater Gibbsiæ, Wernham. A. Flowering branch; B. Calyx; C. Portion of involucre; D. Part of calyx.

Folia 2·5–3·5 cm. × 0·5–1·0 cm., glaberrima, utrinque angustata; petiolus circa 3·5 mm. longus. *Stipula* circa 1 cm. × 0·4 cm. *Pedicella* crispata ad 1·5 cm. longa. *Involucri* bracteæ aliæ subintegræ, ovato-lanceolatæ, sub anthesin circa 8 mm. × 2·5 mm., aliæ aliquanto minores, irregulariter trilobatæ margine in filamenta longiuscula producto. *Calycis tubus* 3–4 mm., lobi circa 5 mm. × 2 mm. basi lat. *Corollæ tubus* 1·3 cm., lobi obtusi, ovati, 5 mm. longi. *Filamenta* circa 3 mm. longa, antheris 2 mm. longis. *Stylus* 1·8–2 cm. longus. *Capsula* vix 3 mm. × 2·5 mm., itaque quam corona calycina non accrescens brevior.

Oldenlandia erythræoides, *Miq. Fl. Ind. Bat.* ii. (1856) 353.

Kaningau plain, 1000′, in "Lalang" clearings. Fl. Jan. 2950.

Distrib. Borneo (B. N. B. Plains by Menkabong river, *Burbidge*; D. Borneo). Sumatra.

"A herb, 0·3–1 m., with light mauve flowers."

Oldenlandia diffusa, *Roxb. Fl. Ind.* i. (1832) 423.

Melalap, 800′, common weed throughout the country in clearings. Fl. Fr. Jan. 2776.

Distrib. Eastern India and Malaya.

"A herb with white flowers."

Mussænda frondosa, *Linn. Sp. Pl.* 177.

Tenom, 700–1300′, general in clearings and sec. forest. Fl. Jan. 2929.

Distrib. General throughout Borneo. Tropical Himalaya, Eastern India, and Malaya.

"Shrub, often scrambling. Also seen at Kiau."

*Urophyllum streptopodium, *Wall. Cat.* n. 8317 *partim* (1830).

Kinabalu, Gurulau spur, above Kiau, 5000′, in high forest on ridge. Fl. Feb. 3975.

Distrib. Malaya.

"A tree, with green flowers."

Urophyllum lineatum, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 177.

Kinabalu, from Lobang to above Kamburangau, 5000–8000′, in high forest, common. Fr. Feb. 4046.

Distrib. Borneo (B. N. B. Kinabalu, Maraiparai spur, 5500′, *Haviland*).

"A tree, with white fruit."

*Urophyllum nigricans, *Wernham*, sp. nov.

Arbor glabra, ramulis gracilibus; *foliis* saliciformibus caudato-acuminatis basi acutis, venis secundariis paucis, reticulo tertiario transverso subtus

manifesto, petiolo breviusculo ; *stipulis* lineari-subulatis setaceo-caudatis mox deciduis. MAS : *inflorescentia* pauciflora laxiuscula sparsissime breviterque strigoso-pubescente subumbellata, pedunculo modico, bracteis inconspicuis, pedicellis longiusculis ; *calyce* brevissimo, limbo subintegro vel obscure dentato, minutissime hirtello vel subglabro ; *petalis* ovatis obtusiusculis ; *ovario* obsoleto. FEMINA : inflorescentia et floribus ut in mare nisi petalis 6 acutioribus, ovario 6-mero manifesto ; *bacca* pisiformi ut flores ac folia in siccitate nigra.

Hab. Kinabalu, above Lobang rock, 6000′, in high forest. Fl. Feb. ♀. 4115, ♂. 4112. Flowers green.

Also from Sarawak (*Beccari* 1669 ; Matang, *Ridley* 12279).

A tree, with glabrous branchlets and leaves, the latter oblong-lanceolate and lengthily acuminate, 12 cm. or longer and 3–4 cm. broad, with a petiole 5–10 mm. long. Secondary nerves 7 or 8 pairs, the subulate stipules reaching 1 cm. in length. Inflorescence about 2 cm. in greatest extent, seldom approaching 3 cm. Flowers 4–5 mm. long ; corolla 3–4 mm. long, and the same in greatest diameter. The whole plant blackens in drying—a distinctive feature. The nearest affinity appears to be with *U. potatorum*, King, from Mt. Ophir, which differs in the size of the leaves, the shape of the stipules, and in the flowers.

*TARENNA GIBBSIÆ, *Wernham*, sp. nov.

Arbor nisi inflorescentia nonnunquam sparse et minutissime puberula glaberrima, in siccitate nigricans, ramulis complanatis ; *foliis* elliptico-lanceolatis apice breviuscule basin versus leniter acuminatis petiolatis ; *stipulis* parvis triangularibus ; *inflorescentia* modica thyrsoidea ramulis divaricatis ; *bracteis* linearibus ; *calycis* glabri limbo patente hemisphærico dentibus late deltoideis brevissimis ; *corollæ* tubo brevi lobis oblongis subacutis demum reflexis minore, nisi ore puberulo glaberrimo ; *antheris* linearibus apiculatis basi lobatis corollæ lobos subæquantibus e tubo exsertis ; *ovulis* in ovarii loculis solitariis in placentis supra septi medium subpeltatim affixis immersis ; *stylo* glabro, antheras vix excedente.

Hab. Kinabalu : Lobang, 5000′, in high forest. Fl. Feb. 4106.

A tree, with white, sweet-scented flowers, distinctive in its almost entire glabrousness. The mature leaves measure about 17 cm. (including an acumen of 2 cm.) in length, and 5 cm. in breadth, with petioles 1–2 cm. long ; lateral veins, manifest above, prominent below, in 10–12 pairs. Stipules about 5 mm. × 3 mm. Inflorescence not exceeding 6 cm. ; bracts up to 5 mm. long. Pedicels about 5 mm. with 2 or 3 small hooked bracteoles. Calyx-limb 1·5 mm. long, ovary 2 mm. Corolla-tube 4 mm. long, lobes 7 mm. × 3 mm. Anthers 5 mm. long ; style exserted about 6 mm.

This differs from most of the species in its almost glabrous inflorescence,

and in the solitary ovules. The general habit and the immersion of the ovule in a stalked placenta justify the inclusion of this species in the genus *Tarenna*.

RANDIA DENSIFLORA, *Benth. Fl. Hongk.* 155 (1861).

Kabayo, 1000′, in sec. forest. Fl. Feb. 4290.

Distrib. Borneo (B. N. B. Koung, 2000′, *Haviland*). Widely distributed throughout Malaya and Indo-China, Eastern India, South China, and North Australia.

GARDENIA MERRILLII, *Elmer in Leafl. Philipp. Bot.* i. (1906) 5.

Kotabelud, 500′, on exposed sandstone hills. Fl. Fr. March. 4340.

Distrib. Philippines.

"A shrub about 3 m. high with large sweet-scented white flowers. This handsome shrub with its beautiful flowers was observed by Spencer St. John (7. 242) and Burbidge (9. 249) in the same locality; both authors describe the plant as 'a bush about 2 ft. in height.' It was also abundant at Kindu on a similar formation."

KNOXIA CORYMBOSA, *Willd. Sp. Pl.* i. 582.

Tenom, 700′, in clearings. Fl. Fr. Jan. 2764.

Distrib. Tropical Asia and Australia.

IXORA STRICTA, *Roxb. Fl. Ind.* i. (1832) 379.

Tenom, 1300′, in primary high forest. Fl. Jan. 2876. Between Tambunan and Korikut, 2000′, in sec. forest, common everywhere. Fl. Fr. 3023.

Distrib. Eastern India and Malaya.

PAVETTA INDICA, *Linn. Sp. Pl.* 110.

Tenom, 700–900′, common in sec. forest. Fl. Fr. Jan. 2765.

Distrib. Tropical Asia and Australia.

PAVETTA SUMATRENSIS, *Roth, Nov. Pl. Sp.* 88

Jesselton, near Government House, 200′, in young sec. forest. Fl. Jan. 2581.

Distrib. Sumatra.

"A small tree, 2 m. high, with white flowers."

PSYCHOTRIA MALAYANA, *Jack in Mal. Misc.* i. 3.

Kinabalu, near Lobang rock, 5000′. Fl. Feb. 4128. Near Bundu Tuhan, 3000′, in sec. forest. Fl. Fr. 3950.

Distrib. Borneo (B. N. B. Tuaran river, *Haviland*). Malaya.

"A small tree, with white flowers."

CHASALIA CURVIFLORA, *Thw. Enum. Pl. Zeyl.* 150.

Tenom, foothill slopes, and railway track to Rayoh, 700–800′, in marshy secondary forest. Fl. Jan. 2691. Clearing in sec. forest. 2787.

Distrib. Eastern India and Malaya.

"A shrub 1–1½ m. high, with white or pink flowers."

LASIANTHUS KINABALUENSIS, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 184.

Kinabalu, Maraiparai spur, 5500′, in mossy forest, a white-flowered shrub. Fl. Feb. 4423.

Distrib. Borneo (B. N. B. Kinabalu, Penokok, 3000–3200′, *Haviland*).

LASIANTHUS APPRESSUS, *Hook. f. Fl. Brit. Ind.* iii. 181.

Tenom, 700–1000′, in sec. forest. Fl. Fr. Jan. 2881.

Distrib. Malaya.

"A shrub 1½ m. high, with white flowers and prussian-blue berries."

SAPROSMA BORNEENSIS, *Wernham*, sp. nov.

Frutex glaber, ramulis virgatis sæpe cortice laxa pallida indutis; *foliis* lanceolatis vel ellipticis utrinque angustatis glabris venis secundariis distantibus, petiolo brevi; *inflorescentia* pauci-(2–3-)flora sessili glomerulata bracteis concavis acuminatis albidis pergamaceis; *floribus* sessilibus albis; *calycis* limbi lobis lanceolatis acutis, in fructu baccato cæruleo ellipsoideo persistentibus.

Hab. Tenom, railway track to Rayoh, 700′, in marshy secondary forest. Fl. Fr. Jan. 2799.

A shrub 0·25–0·75 m. high; leaves 8 cm. × 2·5 cm. to about 12 cm. × 5 cm.; petiole rarely more than 5 mm. The triangular stipules are whitish, like the bracts, and 2- or 3-pronged, 3–4 mm. long. Bracts up to 5 mm. long. Berry 8 mm. × 5 mm., with persistent calyx nearly 2 mm. long.

Very near the Indian *S. indicum*, Dalz., but distinct in the small size of the plant and in the well-defined, subequal, calyx-segments.

MYRMECODIA ECHINATA, *Gaud. in Freyc. Voy. Bot.* 472, t. 96.

Sapong, 700′, an epiphyte in sec. forest. Fl. Jan. 2762.

Distrib. Rawak and Aru Islands.

"Green tuber, with hollow passages tenanted by ants."

COPROSMA HOOKERI, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 187.

Kinabalu, summit, 13,200–13,500′. ♂. 4204. ♀. 4303.

Distrib. Borneo (B. N. B. Kinabalu, 13,000′, *Haviland*).

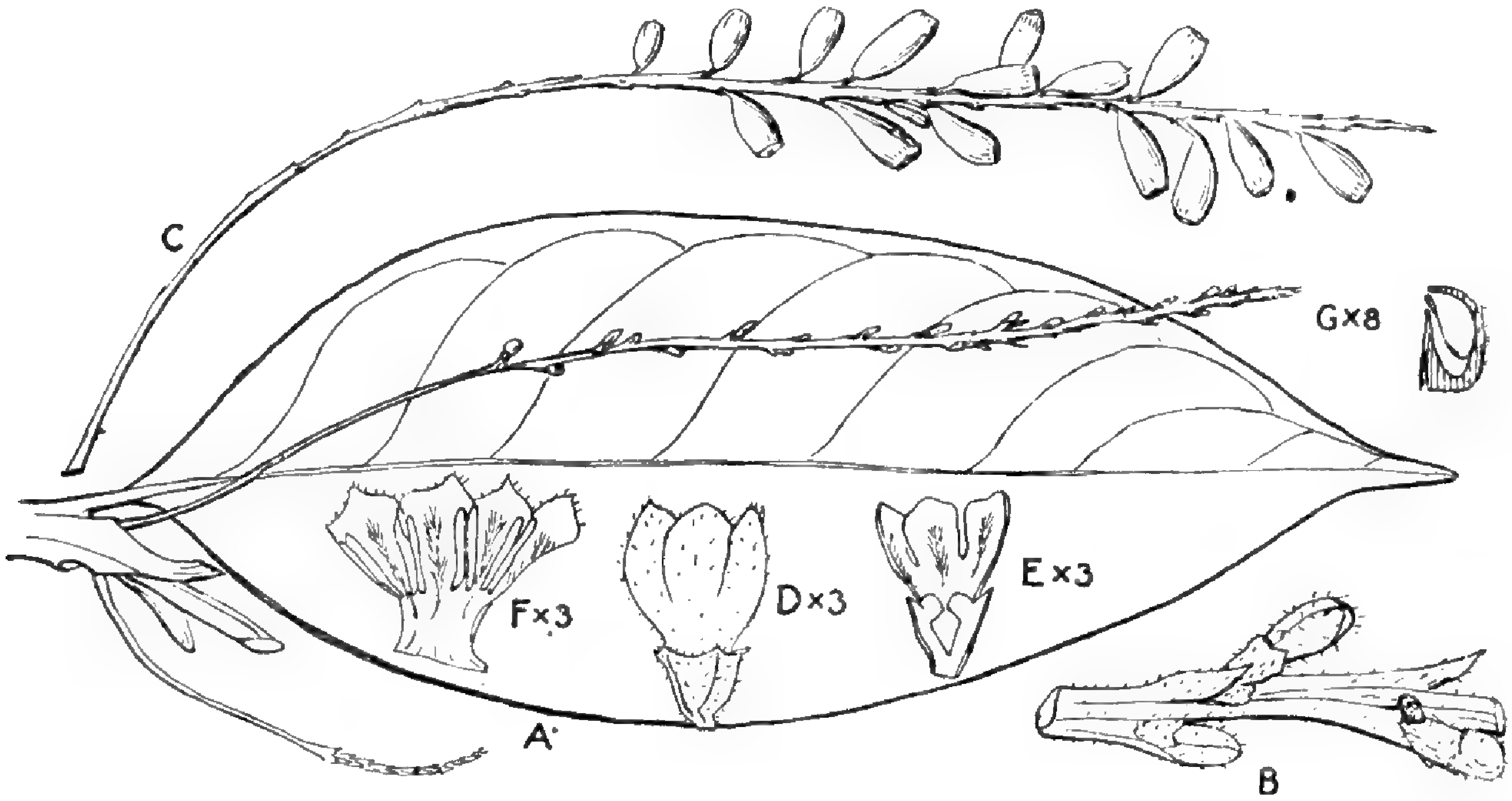
"An erect shrub, half a metre high."

Cowiea, *Wernham*, gen. nov.

Calycis tubus campanulatus; limbus minute 5-dentatus. *Corolla* infundibularis, tubo brevi, fauce barbata; limbi lobi 5, stricte contorti, oblongi, obtusi, lati. *Stamina* 5, corollæ faucem versus inserta; antheræ lineares, crassiusculæ, subsessiles, dorso affixæ. *Discus* non valde conspicuus. *Ovarium* 2-loculare; *stylus* crassus, clavatus, capillarum lineis decem dense barbatus: *ovula* in loculis gemina, a septi apice pendula. *Fructus* baccatus, bilocularis, semina in loculis gemina pendula. *Frutex* scandens. *Folia* opposita; stipulæ integræ. *Flores* inter minimos in spicis axillaribus gracilibus longissimis sessiles, bracteis inconspicuis.

This genus should clearly be included in the tribe Gardenieæ, the nearest ally being *Petunga*. The distinction from this latter is readily seen, especially

Fig. 4.



Cowiea borneensis, Wernham. A. Leaf with young inflorescence, reduced; B. Part of inflorescence; C. Fruit; D. Flower; E. Corolla with calyx; F. Corolla; G. Longitudinal section of ovary.

in the climbing habit, the indefinitely long, slender, spicate inflorescences of very small pentamerous flowers, and the short thick clavate style.

This interesting new genus has been named in honour of the late W. C. Cowie, Esq., for many years Chairman and Managing Director of the British North Borneo Co., to whose public spirit and enterprise the inclusion under the British flag of the fine country he was so long associated with is greatly due.

COWIEA BORNEENSIS, *Wernham*, sp. nov.

Frutex scandens glaber, ramulis gracilibus quadrangulatis; *foliis* brevissime petiolatis glaberrimis coriaceis ellipticis utrinque angustatis acutis; *stipulis* lanceolatis acuminatis vix connatis; *cymis* sessilibus 2–4-floris in spicis rhachi longissima brevissime griseo-tomentosa pro rata distantibus et irregulariter dispositis; *calycis* tubo hispidiusculo limbi dentibus obscuris; *corolla* extus sparse hirto-pubescente intus in fauce dense barbata cæterum glabrata, tubo brevi basi ventricoso, lobis 5 concavis; *antheris* inclusis. *Bacca* anguste turbinata apice umbilicata.

Tenom, 700′, by the railway track in marshy sec. forest. Fl. Jan. 2794. Fr. 2795.

Folia circa 16 cm. × 5 cm.; petiolus 5–8 mm.; stipulæ 1·3 cm. longæ, basi fere ad 5 mm. latæ. Spicæ juniores ad 20 cm., seniores ad 50 cm. longæ; pedicelli 5–6 cm. longi. Corolla tota vix 3 mm. longa; calyx 1 mm. longus; antheræ 1·5 mm. longæ; stylus cum stigmate 1·5 mm. longus. Bacca circa 8 mm. longa, 4 mm. diametro.

COMPOSITÆ. (S. MOORE.)

VERNONIA ARBOREA, *Buch.-Ham. in Trans. Linn. Soc.* xiv. (1824) 218.

Near Apin Apin, 1000–2000′, edge of sec. forest, general. Fl. Feb. 2973.

Distrib. Borneo (B. N. B. Labuan, *Motley*; Sarawak; D. Borneo). Malay Peninsula, Java, Sumatra and Philippines; Indo-China to India and Ceylon.

ELEPHANTOPUS SCABER, *Linn. Sp. Pl.* 814.

Tenom, 700′, old "campong" sites and "kebuns." Fl. Jan. 2641.

Distrib. Borneo (Sarawak; D. Borneo). Throughout the tropics.

*ADENOSTEMMA VISCOSUM, *Forst. Char. Gen.* 90.

Kinabalu, steep slopes above Lobang rock, 6000′, in high forest. Fl. Feb. 4118.

Distrib. General in the tropics.

MIKANIA SCANDENS, *Willd. Sp. Pl.* iii. 1743.

Tenom, near Melalap, 800′, banks of Pengallan river. Fl. Jan. 2739.

Distrib. Borneo (B. N. B. Kiau, 3000′, *Burbidge*; Sarawak; D. Borneo). Tropics generally.

BLUMEA CHINENSIS, *DC. Prod.* v. 444.

Tenom, 700′, old "campong" sites and "kebuns." Fl. Jan. 2628.

Distrib. Malay Peninsula, Java, and Philippines; Indo-China to India.

*Blumea balsamifera, *DC. Prod.* v. 447.

Kinabalu, steep slopes above Lobang rock, 6000′, undergrowth in high forest. Fl. Feb. 3115.

Distrib. Borneo (B. N. B. Sandakan, *Fraser & Creagh*; Labuan, *Burbidge*; Sarawak; D. Borneo). Malay Peninsula, Java, Sumatra, Buru, and Philippines; Indo-China to India.

Common throughout the country.

Blumea borneensis, *S. Moore*, sp. nov.

Frutex vel arbuscula, *ramis* teretibus striatulis griseo-tomentosis deinde glabrescentibus; *foliis* inferioribus majusculis superioribus nobis solummodo obviis multo minoribus lanceolatis acutis basin versus in petiolum brevem gradatim desinentibus margine serratis serraturis nigro-induratis, supra subtiliter pubescentibus, subtus tela densa grisea obsitis; *capitulis* in paniculam apertam sublaxam crebro bracteatam griseo-tomentosam digestis; *involucri* campanulati circa 7-serialis phyllis exterioribus abbreviatis lineari-lanceolatis acutis phyllis serierum 3 intimarum e basi comparate lato anguste linearibus obtusiusculis superne nigris omnibus dorso pubescentibus; *flosculis hermaphroditis* circiter 10; *antherarum* caudis omnimodo per paria connatis; *stylo* flosculorum hermaphroditorum bifido; pappi setis scabriusculis sordide albis.

Tenom, 700′, near "campongs" and old "kebuns." Fl. Jan. 2629.

A shrub or small tree growing to a height of 5 metres. Lower leaves (not collected) reaching 2 dcm. in length, upper 4–6 cm. long, 10–16 mm. broad; lateral nerves visible on the lower side only, 9–12 pairs, ascending arcuate; petioles less than 1 cm. in length. Panicle about 7×14 cm., with rather numerous divaricating branches; oldest bracts like the leaves, only smaller, younger linear-lanceolate, ± 5 mm. long. Flowering heads about 7×7 mm. Outermost involucral leaves 1·5 mm. long, of the third row 3 mm., of the fourth row 4 mm., and of the innermost rows 6·5 mm. long. Corolla of female plants 5 mm. long, of hermaphrodite 5·5 mm., the tube of the latter expanding in its upper half to 0·5 mm. Andrœcium exserted for a short distance. Style-arms protruding beyond the anthers, 1 mm. long. Achenes (unripe) cylindrical, 1 mm. long, nearly or quite glabrous; setæ of the pappus few, apparently persistent, 6 mm. in length.

B. balsamifera, DC., to which this is nearest, has somewhat larger flowering heads with a densely tawny-tomentose involucre, and achenes with a red pappus.

Pluchea indica, *Less. in Linnæa*, vi. (1831) 150.

Usakan, banks of Abai river, on land edge of mangrove belt. Fl. March. 4322.

Distrib. Borneo (B. N. B. Kudat, *Fraser* and *Creagh*). Malay Peninsula, Java, Amboina, Timor Laut, Philippines, and New Guinea; Indo-China to India.

ECLIPTA ERECTA, *Linn. Mant.* ii. 286.

Tenom, 7000–1000′, marshy open places, general. Fl. Jan. 2859. Also seen on Kaningau plain.

Distrib. Borneo (Sarawak; D. Borneo). Common weed in the tropics and subtropics.

SYNEDRELLA NODIFLORA, *Gaertn. Fruct.* ii. 456, t. 171.

Between Tenom and Melalap, 700′, in open marshy ground by railway. Fl. Jan. 2788.

Distrib. Tropical America originally, now spread in India. Malay Peninsula and Java.

BIDENS PILOSA, *Linn. Sp. Pl.* 832.

Tenom, slopes above 700–800′, in open clearings. Fl. Jan. 2686. Melalap, 800′, in a Chinese garden. 2724.

Distrib. Borneo (D. Borneo). Common in warm countries.

MYRIOGYNE MINUTA, *Less. in Linnæa,* vi. (1831) 219.

Kaningau plain, near Station, 1000′, in open marshy "Lalang." Fl. Feb. 3116.

Distrib. Malay Peninsula, Java, Sumatra, Philippines, New Caledonia to Australia; China and Japan; Indo-China to India and Ceylon.

GYNURA SARMENTOSA, *DC. Prod.* vi. 298.

Renagong, 2800′, in sec. forest. Fl. Feb. 3944.

Distrib. Borneo (D. Borneo). Malay Peninsula, Java, Sumatra, Bangka, Philippines; Indo-China.

Common all through the country, trailing through trees.

EMILIA SONCHIFOLIA, *DC. Prod.* vi. 302.

Tenom, 700–1000′, general in open ditches and damp places. Fl. 2675. Also seen at Kaningau.

Distrib. Borneo (D. Borneo). Malay Peninsula, Java, Celebes, Timor Laut, Philippines, and New Guinea; China and Japan, Indo-China to India. Tropical Africa.

*No. 4202 is a Composite from the summit of Kinabalu with the habit of *Lagenophora*, and possibly a species of that genus: if this be so, it is a matter of much interest from the phytogeographical point of view. Unfortunately, the flowering-heads are not sufficiently advanced to allow of certainty as to the genus to which the plant should be referred.

GOODENOVIACEÆ.

*SCÆVOLA PEDUNCULATA, var. MOLLIS, *Merrill in Philipp. Journ. Sci. Bot.* v. (1910) 251.

Kinabalu, Maraiparai spur, 5000′, on open serpentine. Fl. Feb. 4048.

Distrib. Borneo (B. N. B. Kinabalu, Maraiparai, *Haviland*). Philippines.

A shrub with white flowers. The following note is appended to Haviland's specimen (1290, Herb. Kew.). "This plant I found without label next to plants from Penokok and Maraiparai. I thought I remembered it as a small shrub which grew at Maraiparai and more plentifully in an open space 200 ft. lower." Dr. Stapf (17) did not consider the above sufficiently authentic to warrant the inclusion of this plant in his list. The species was subsequently collected in the island of Palawan (Foxworthy, 700, March–April), and Merrill bases his var. *mollis* on that collection.

CAMPANULACEÆ.

PRATIA BORNEENSIS, *Hemsl.*, var. GRANDIFLORA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 188.

Kinabalu, above Lobang rock, 6000′, in high forest undergrowth. Fl. Fr. (young) Feb. 4136.

Distrib. Borneo (B. N. B. Kinabalu, Dahobang river, 3000′, *Haviland*; Sarawak; of species).

Herbaceous, 1 m. high, with white flowers. The plant was quite abundant on the steep slopes.

*PENTAPHRAGMA VIRIDE, *Stapf & M. L. Green*, sp. nov. *P. aurantiaco*, Stapf, et *P. Scortechinii*, King & Gamble, affinis, ab illo floribus duplo minoribus, corolla viridi; foliis valde inæquilateralibus, ab hoc floribus subduplo majoribus, corollæ segmentis patentibus viridibusque differt.

Caulis imprimis apicem versus asperulus. *Folia* petiolo circiter 2 cm. longo asperulo suffulta, inæquilateralia, oblique ovata vel oblongo-ovata, obtusiuscula vel subacuminata, 8–14 cm. longa, 5–6·5 cm. lata, basi rotundata et breviter cuneatim constricta, in margine plerumque serrulata, in sicco membranacea, supra glaberrima, subtus asperulo-papillosa, nervo medio prominente, nervis lateralibus utrinque circiter 2. *Cymæ* axillares, breviter pedunculatæ, cernuæ; bracteæ flores arcte congestos involucrantes, ad 1 cm. longæ, late ovatæ, obtusissimæ. *Calyx* campanulatus; tubus subvillosus, tandem glabrescens, 8–9 mm. longus; lobi oblongi, 4–5 mm. longi. *Corollæ* viridis calyce brevioris segmenta 3 mm. longa, glabra, patentia, late oblonga. *Stamina* circa stigma sulcatum conniventia et cohærentia ad 2 mm. longa. *Antheræ* muticæ.

Hab. N. Keppel, between Koung and Kabao, 1000′, in forest on sandstone hills. Fl. Feb. 4291.

ERICACEÆ.

Vaccinium coriaceum, *Hook. f. in Hook. Ic. Pl.* t. 892.

Kinabalu, Pakapaka cave, 10,000′, in low forest. Fl. Feb. 4247.

Distrib. Borneo (B. N. B. Kinabalu, 9000′, *Low* and *Haviland*).

Small tree with pink flowers.

Vaccinium buxifolium, *Hook. f. in Hook. Ic. Pl.* t. 891.

Kinabalu, Pakapaka to granite core, 10,000–11,500, in dwarf forest. Fl. Fr. Feb. 4172.

Distrib. Borneo (Kinabalu, 7500–11,000′, *Low* and *Haviland*).

A small tree with dingy-pink flowers. It occurs from Kamburangau on the open serpentine ridge to the sub-summit dwarf forest which abuts on to the granite core.

Vaccinium cordifolium, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 189.

Kinabalu, above Kamburangau, 8000′, open serpentine ridge. Fl. Feb. 4164. Below Pakapaka, 9500′. 4224.

Distrib. Borneo (B. N. B. Kinabalu, 8800–9000′, *Haviland*).

This exquisite species is one of the commonest and most typical plants on the mountain, occurring on the open serpentine ridge up to the dwarf forest which abuts on the granite core, where in February it was still in bud. The habit is peculiar, the plant consisting of a few untidy, straggling branches 1 m. or more in length, the young shoots being densely covered with a brown tomentum, while the young foliage is red. The corollas are a most delicate pink, varying to white and sometimes over an inch in length, and a perfect oval in shape.

Vaccinium bancanum, *Miq. Fl. Ind. Bat. Suppl.* 587.

Tambunan plain, near Station, 2000′, on open sandy formation. Fl. Fr. Feb. 2998.

Distrib. Borneo (B. N. B. Sandakan, *Creagh*; Sarawak). Malay Peninsula, Bangka.

A shrub, 1·50–3 m. high, with light green, myrtle-like leaves, shining and coriaceous, and white flowers. Gregarious in the above locality.

Gaultheria borneensis, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 190.

Kinabalu, 11,000′, sub-summit dwarf forest. Fl. Feb. 4421.

Distrib. Borneo (B. N. B. Kinabalu, 12,000′, *Haviland*). Philippines.

Diplycosia ciliolata, *Hook. f. in Hook. Ic. Pl.* t. 894.

Kinabalu, Kamburangau to Pakapaka, 7000–10,000′; a small tree, with

white flowers. 4249. A small tree, Pakapaka to granite core, 10,000–11,500′, in dwarf forest. Fl. Feb. 4171.

Distrib. Borneo (B. N. B. Kinabalu, 6000–8000′, *Low* and *Haviland*).

DIPLYCOSIA KINABALUENSIS, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 193, pl. 14 B. 4–6.

Kinabalu, above Kamburangau, 8000′, open olivine-serpentine ridge. Fl. Feb. 4112. Summit, 13,000′, in cracks in granite. Veg. Feb. 4311.

Distrib. Borneo (Kinabalu, 10,000–12,000′, *Haviland*).

A creeping shrub, 10–15 cm. high, with greenish flowers close to the ground, as they occur in the axils of the lowest leaves, the leaves being aggregated towards the ends of the branches. It is abundant wherever the vegetation opens out, both on the serpentine ridge, the dwarf sub-summit forest and granite core to the summit, where it forms one of the chief components of the vegetation. It also occurs on the serpentine of the Maraiparai spur. The margins of the leaves are serrate in my specimens, but are figured as entire in the plate quoted above.

DIPLYCOSIA CINNAMOMIFOLIA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 195.

Kinabalu, above Kamburangau to Pakapaka, 8000–9500′, on open serpentine ridge. Fl. Feb. 3125.

Distrib. Borneo (B. N. B. Kinabalu, 9000′, *Haviland*).

A shrub with waxy pink flowers and very coriaceous leaves.

RHODODENDRON LOWII, *Hook. f. in Hook. Ic. Pl.* t. 883.

Kinabalu, slopes above Lobang rock, 5500′, an undershrub in high forest. Fl. Feb. 4218. Pakapaka cave, 10,000′, a small tree in low forest. Buds Feb. 4169.

Distrib. Borneo (B. N. B. Kinabalu, 8000–10,000′, *Burbidge*, *Low*, and *Haviland*). New Guinea.

This beautiful rhododendron is very conspicuous on the mountain. On the rocky shoulder above Lobang it was just coming into flower as a spreading shrub about 6–7 m. high and of typical rhododendron habit, and was very general as a small tree at Pakapaka by the Kadamaian torrent. The fine yellow flowers are of a wax-like consistency. It grows indifferently as an epiphyte or on the ground.

RHODODENDRON CRASSIFOLIUM, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 195.

Kinabalu, Maraiparai spur, 7000′, in mossy forest. Fl. Feb. 4079.

Distrib. Borneo (B. N. B. Kinitaki river, 5000′, *Low*).

Epiphytic, with red flowers. In this specimen the corollas have been lost,

but the thick leaves with prominent midribs, thin pedicels, glabrous ovaries, short styles and dilated stigmas are unmistakable characters. The Kinitaki river, Haviland's locality for this type, arises on one side of the Maraiparai spur. Stapf (**17.** 159) describes the flowers as white, suffused with red, but in the present instance they were true red in colour.

*Rhododendron (§Eurhododendron) Maxwellii, *Gibbs*, sp. nov.

Frutex vel *arbuscula*, interdum epiphyticum. *Rami* et ramuli ut folia, glabri. *Folia* ad apicem ramulorum sub-verticillata, coriacea, glabra, oblongo-obovata, obtusa, marginibus recurvis, basi sensim angustata ; petioli crassi, glabri. Pedicelli longi, glandulosi. *Flores* flavi. *Calyx* parvus, discoideus, obsolete lobatus, glandulosus. *Corolla* tubulosa, infundibularis, extus dense ac minute furfuracea. *Stamina* 10, filamentis in parte inferiore hirsutis. *Ovarium* dense pilosum, 5-loculare.

Hab. Kinabalu, 6000′, steep slopes above Lobang rock, in high forest. Fl. Feb. 4254.

The leaves of this plant closely resemble those of *R. acuminatum*, Hook. f. in colour (when dry), texture and venation, but, including the petioles, are entirely glabrous on both surfaces, with a very thick and pronounced midrib, giving off 3–5 lateral nerves. The largest leaf is 9·5 cm. long and 4·7 cm. broad, showing the veins very much impressed on the upper surface and prominent on the lower, which gives a markedly bullate appearance to the leaf. The raceme is many-flowered (with 13 flowers in my specimen), with yellow flowers on erect pedicels 3 cm. long ; the corollas are covered with entire scales on the outside, and show hairs on the inside at the base of the tube, which is 1 cm. long and 5 cm. broad, the lobes being 1·3 cm. by 1 cm. The anthers are partially exserted at the mouth of the tube, 3·3 mm. long, with filaments 1·3 cm. long. The ovary is 0·4 mm. in length and 0·2 mm. in breadth.

This plant is nearest to *R. acuminatum*, Hook. f., in the shape and texture of the leaves, and in their verticillate arrangement, also in the entire scales investing the outer surface of the corolla, but approaches *R. rugosum*, Low, in the length of the pedicel, the size of the flower and in the hairy ovary ; in the yellow colour of the flowers it differs from either of the above species.

This fine rhododendron has been named after Mr. D. R. Maxwell, Assistant District Officer for North Keppel, who accompanied me on the occasion of the ascent of Kinabalu. His disinterested kindness in taking the entire responsibility for the organisation and control of the expedition, left me free to devote my whole time to botanical work.

Rhododendron Brookeanum, *Low, ex Lindl. in Journ. Hort. Soc.* iii. (1848) 42.

Kinabalu, Maraiparai spur, 7000–8000′, epiphytic in mossy forest. Fl. Feb. 4042.

Distrib. Borneo (B. N. B. Kinabalu, *Haviland* ; Brunei; Sarawak).

This species is of the same colour, consistency, and size as *R. Lowii*, from which it is distinguished by the narrower leaves. Beccari found it in Sarawak epiphytic on mangroves, at sea-level. The beautiful yellow flowers may be suffused with red on the outside.

RHODODENDRON STENOPHYLLUM, *Hook. f., ex Beccari, Malesia*, i. 203.

Kinabalu, Kamburangau, 7000′, in mossy forest. Fr. Feb. 4148. Above Kamburangau, 7500′, in mossy forest. Fl. Feb. 4235.

Distrib. Borneo (B. N. B. Kinabalu, 5000–8000′, *Low*, *Burbidge*, and *Haviland*).

A lanky shrub, epiphytic or on the ground, only seen with one or two shoots, 0·75–1 m. high, with leaves in whorls up the stem, which is terminated by one or two flowers of a most pleasing bright red colour and shining waxy texture.

RHODODENDRON RUGOSUM, *Low, ex Hook. f. in Hook. Ic. Pl.* t. 885.

Kinabalu, from Kamburangau to above Pakapaka, 7000–10,500′, low forest and on open ridge. Fl. Feb. 4419.

Distrib. Borneo (B. N. B. Kinabalu, 7000–10,000′, *Low*, *Burbidge*, and *Haviland*).

Very general as tree or epiphyte. The lovely heads of waxy-pink flowers formed one of the most vivid impressions in the ascent of this favoured mountain.

RHODODENDRON ACUMINATUM, *Hook. f. in Hook. Ic. Pl.* t. 886.

Kinabalu, Pakapaka, 10,000′, edge of Kadamaian torrent. Fl. Feb. 4214.

Distrib. Borneo (B. N. B. Kinabalu, 6000–8000′, *Low*).

A small tree, with red flowers, which, in this case, are smaller than in Low's specimen.

RHODODENDRON CUNEIFOLIUM, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 198, pl. 15 B. 3.

Kinabalu, Maraiparai spur, 6000′, common in mossy forest. Fl. red. Feb. 4420. Kamburangau, 7000′, a shrub, epiphytic or on its own roots. Fl. salmon-red. Feb. 4151.

Distrib. Borneo (Kinabalu, 7000′, *Haviland*). Philippines.

RHODODENDRON ERICOIDES, *Low, ex Hook. f. in Hook. Ic. Pl.* t. 887.

Kinabalu, summit, 13,000′, cracks in granite. Fl. Feb. 4199, 4276. Granite core, cracks, 12,000–12,500′. Fl. Feb. 4180, 4306.

Distrib. Borneo (Kinabalu, from 8000′ almost to top, *Low*, *Burbidge*, and *Haviland*).

This is one of the most abundant plants on the mountain. Beginning in

the mossy forest below Kamburangau, as a shrub 1–2 m. high, it runs up to the summit, where, on the open granite, it is reduced to a spreading wind-clipped plant, 2–4 dm. in height.

Clethra canescens, *Reinw. in Blume, Bijdr.* 863.

Renagong, 3000′, in sec. forest. Fl. Feb. 3032.

Distrib. (B. N. B. Kulawat, 2000′, *Lobb* ; Ulu Tawaran, 2000′, *Haviland*). Java, Sumatra, and Celebes.

A tree, with white flowers, abundant from Patau Patau to Renagong.

EPACRIDACEÆ.

*Styphelia Learmonthiana, *Gibbs*, sp. nov.

Arbor parva, ramis cortice griseo circumdatis, cicatricibus foliorum delapsorum crebre onustis. *Folia* alterna, petiolata, 5–7-striata, elliptico-oblonga, acuminata, basi sensim angustata, glabra, paucinervosa. *Racemi* axillares, multiflori, floribus parvis sessilibus 4-bracteatis, bracteis late-ovatis. *Sepala* ovato-elliptica, corollæ tubum semiæquantia. *Corolla* intus supra medium pilosa ; lobi superne recurvi, glabri. *Stamina* corollæ ori affixæ, filamentis exsertis lobis corollæ æquilongis. *Ovarium* 10-loculare, stylo incluso, stigmate parvo.

Hab. Kinabalu, Kamburangau to sub-summit dwarf forest, 9000–12,000′. Fl. Feb. 4126. Granite cracks on summit, 13,000′, dwarf shrub. 4305.

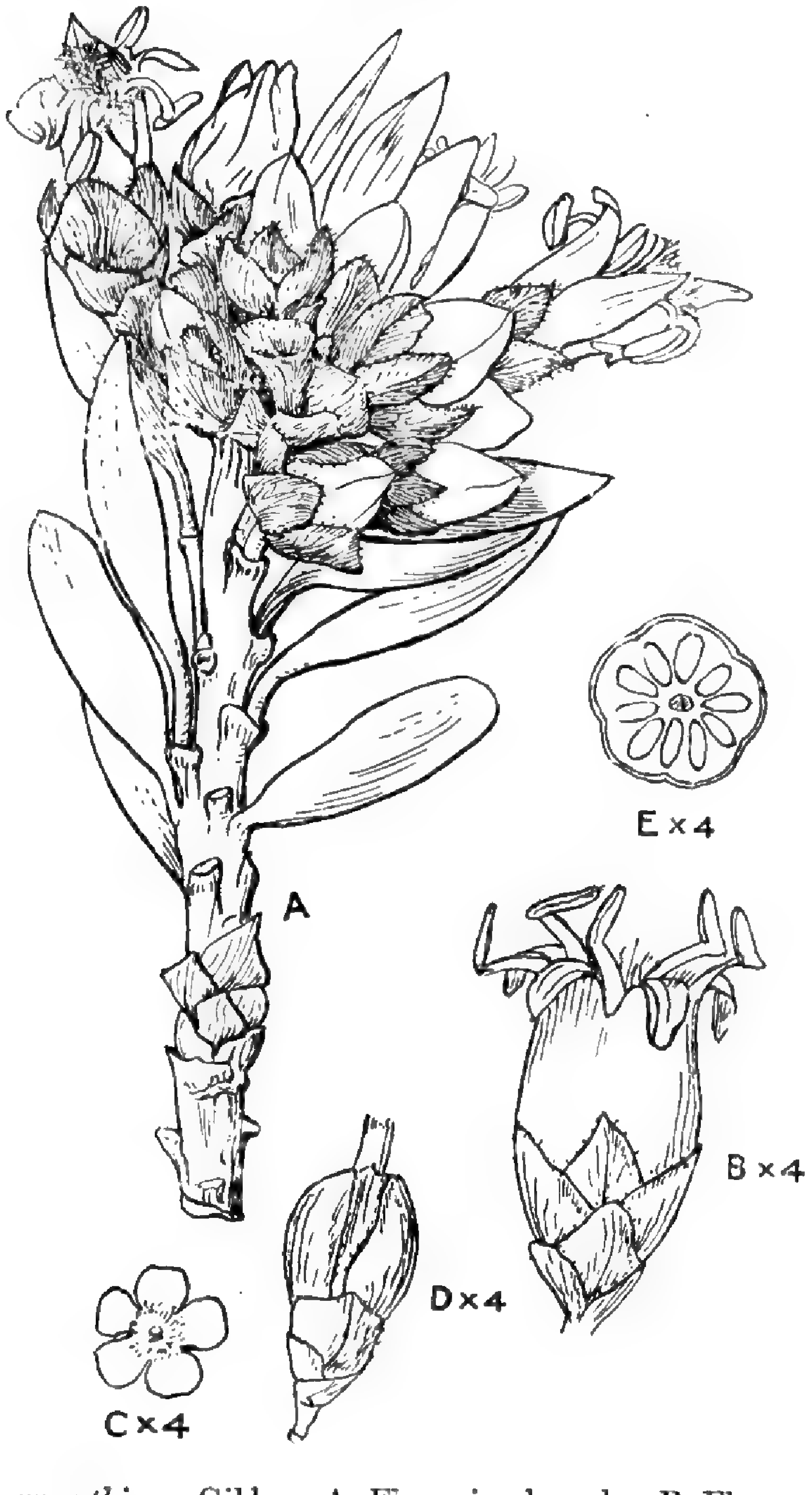
A small tree, occurring from Kamburangau to the sub-summit dwarf forest, but reduced on the summit proper to a dwarf shrub with decumbent branches, running along the granite cracks with erect shoots 1 dm. in height. The flat leaves, with petioles 1 mm. long, are 7 mm. long and 2 mm. broad, with a shining upper surface, the venation being visible on the lower surface only, which is lighter in colour and shows 5–7 parallel veins, of which the two lateral ones may be slightly branched. The sepals and bracts are conspicuously reddish in colour and red-veined. The corollas are white, 4 mm. long and 3 mm. broad, with glabrous recurved lobes and five tufts of hairs which extend from the neck to half-way down the corolla-tube ; the stamens are exserted and recurved in the dried specimens, the anthers being 1 mm. long with no sterile tips, while the filaments are glabrous and 2 mm. in length. The ovary is 1 mm. and the style 2 mm. long ; the former is glabrous, with 1 ovule in each cell, and inserted with 5 hypogynous scales united at the base.

According to Bentham and Hooker this plant would come under *Styphelia*, on the strength of the coloured calyx with 4 subtending bracts, the reflexed lobes of the corolla-tube, with the five tufts of hairs extending to the middle

of the same, and the exserted stamens; but the 10-locular ovary with included style would place it in *Leucopogon*.

This interesting new species has been named after Captain Learmonth, R.N., to whom I have been indebted for much valuable information included

Fig. 5.



Styphelia Learmonthiana, Gibbs. A. Flowering branch; B. Flower; C. Scales; D. Persistent calyx; E. Transverse section of ovary.

in this paper. In July 1910, he spent six days on the summit of Kinabalu, in practically a ceaseless downpour of rain, to enable him to complete his work on the Admiralty Survey of the North Bornean Coast.

STYPHELIA MALAYICA, *Drude in Engl. Pflanzenfam.* iv. I. 78.

Kinabalu, Maraiparai spur, 5500′, on the open serpentine ridge. Feb. 4053.

Distrib. Borneo (B. N. B. Kinabalu, 5500′, *Haviland*; Labuan; Sarawak). Malay Peninsula, Sumatra, and Banka Island.

STYPHELIA SUAVEOLENS, *Koord. Excurs. Fl. v. Java*, iii. 22; *Hook. f. in Hook. Ic. Pl.* sub t. 898.

Kinabalu, Kamburangau to granite core, 8000–12,000′. Fl. Feb. 4241. Summit form, 13,000′, prostrate in cracks of granite. Fl. Feb. 4179.

Distrib. Borneo (B. N. B. Kinabalu, 8000–13,000′, *Whitehead* and *Haviland*). Celebes and Philippines.

STYPHELIA LANCIFOLIA, *Gibbs*, comb. nov.

Leucopogon lancifolius, Hook. f. in Hook. Ic. Pl. t. 89.

Jesselton, 100′, on open sandstone spurs. Fl. Jan. 2578.

Distrib. Borneo (B. N. B. *Low* and *Burbidge*; Balambangan Island, *Fraser*).

MYRSINACEÆ. (H. F. WERNHAM.)

MÆSA RAMENTACEA, *Wall. in Roxb. Fl. Ind.* ii. 230 (1824).

Apin Apin, 2000′, a liane in sec. forest, and abundant from Tambunan to Renagong. Fl. (white) Feb. 2986. Apin Apin to Renagong, 2800′, a liane in sec. forest. Fl. (cream). 2991. Bundu Tuhan, 3000′, a small tree in sec. forest. Fl. (yellow). 3949.

Distrib. Widely distributed in tropical Asia.

*ARDISIA ZOLLINGERI, *A. DC. Prod.* viii. 670 (1844).

Kinabalu, Gurulau spur, 5000′, in high forest. Fl. Feb. 3984, 4002 *bis*.

Distrib. Borneo (Sarawak). Malay Peninsula, Java, Sumatra.

"A tree with white flowers."

ARDISIA AMABILIS, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 203.

Kinabalu, slopes above Lobang rock, 5500′, in high forest. Fl. Feb. 4116.

Distrib. Borneo (B. N. B. Kinabalu, 6000′, *Haviland*).

"Flowers white."

ARDISIA OXYPHYLLA, *Wall. Cat.* n. 2291 (1830).

Kinabalu, Lobang rock, 5000′, in high forest. Fl. Feb. 4102.

Distrib. Borneo (B. N. B. Kinabalu, 5000′, *Haviland*). Tenasserim, Andaman Islands, Sumatra.

"A shrub, with pink flowers."

ARDISIA SERRATA, *Pers. Syn.* i. (1805) 233.
About Tenom, 700–1000′, in sec. forest. Fl. Fr. Jan. 2667.
Distrib. Borneo and Philippines.
"A handsome and conspicuous tree with pink flowers in dense erect racemes, recalling a horse-chestnut in the habit of the leaves and in the inflorescence."

ARDISIA BRACHYTHYRSA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 202.
Kinabalu, Maraiparai spur, 7000′, in mossy forest. Fl. Feb. 4045.
Distrib. Borneo (B. N. B. Kinabalu, 3000′, *Haviland*).
"A tree 13 m. high, with pink flowers."

ARDISIA VESTITA, *Wall. in Roxb. Fl. Ind*, ii. (1824) 274.
Near Tenom, 700′, in clearings. Fl. Jan. 2763.
Distrib. Indo-China and Indian Archipelago.
"Herbaceous, 0·75 m., with red flowers."

ARDISIA VIRENS, *Kurz, For. Fl.* ii. (1877) 575.
Rayoh hills, Tenom, 2000′, in high forest. Fl. Jan. 2886.
Distrib. Assam, Manipur, and China.
"A small tree, flowers white, dotted grey."

*ARDISIA COPELANDII, *Mez.*
Kinabalu, Gurulau spur, above Kiau, 5000′, in high forest. Fl. Feb. 3078.
Distrib. Mindanao, Philippines.
"A tree, 17 m. high, with mauve flowers."

*EMBELIA KINABALUENSIS, *Wernham*, sp. nov.
Arbor ramulis glaberrimis longitudinaliter rugosis; *foliis* breviter petiolatis, margine revoluto, ellipticis apice rotundatis nec acuminatis basin versus leniter angustatis crasse coriaceis glaberrimis, costis densiusculis parallelis paullum manifestis, punctulis atris minutissimis numerosissimis præditis; *inflorescentia* multiflora pinnatim paniculata densiuscula sparsissime vix glandulose puberula, pedicellis prominulis; *floribus* albis inter minutos tetrameris; *sepalis* ad dimidium vel ultra coalitis, lobis latis obtusissimis; *petalis* oblongis obtusis dorso glabris intus et margine dense glanduloso-villosis; *staminibus* petalis multo brevioribus; *ovario* globoso, stylo brevissimo, stigmate pulvinato.
Hab. Kinabalu, from Kamburangau to granite core, in mossy and dwarf forest, at 7500–12,000′. Fl. Feb. 4161.
A tree with white flowers and thick leathery leaves about 12 cm. × 5·5 cm.

The available material is somewhat scanty, but sufficient to distinguish this species from *E. coriacea*, Wall., its nearest affinity. The chief points of difference are the rounded leaf-apices, the smaller leaves with very indistinct veins, the almost glabrous inflorescence-branches, and the tetramerous flowers with very obtuse and broad sepals and petals.

STYRACEÆ.

SYMPLOCOS OBLONGIFOLIA, *Rolfe in Journ. Bot.* xxiii. (1886) 214; *Vidal, Phan. Cuming Philipp.* 33 & 124.

Carlea oblongifolia, Presl, Epim. Bot. 216 (1849).

Usakan, 500′, on open sandstone spurs, isolated. Fl. Fr. March. 4324.

Distrib. Philippines.

Shrub, 3 m. in height, of fastigiate habit, with the leaves aggregated towards the ends of the branches, and white flowers. It was also seen at Jesselton in January on a similar formation, but not in flower. The species was first collected by Cuming in Luzon (1054) and described as *Carlea oblongifolia* by Presl (Epim. Bot. 216). My plant agrees in every particular, with the exception of the length of the racemes—which are 5 cm., and not 5–10 cm., long—with Presl's description, but a series of specimens, collected since by Vidal (No. 1214) and preserved in the herbarium at Kew, also has the racemes only 5 cm. long. Compared with the type-specimen and other material, the flowers in the Usakan plant are smaller, but I am not inclined to base a variety on this fact, as the plant was only seen on dry sandstone formation, where the soil is exposed and injudicious clearing and washed out by heavy rains.

SYMPLOCOS DEFLEXA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 205.

Kinabalu, Pakapaka, 10,000′, in low forest. Fl. Fr. Feb. 4267.

Distrib. Borneo (B. N. B. Kinabalu, 8000′, *Haviland*).

This plant agrees very well with the above species, except in the total glabrousness of the stem and leaves, the latter showing no deflexion. Only the very youngest branches, with the peduncles, pedicels, bracteoles and calyces of the flowers, show sparsely adpressed white hairs. Haviland's specimens have no flowers; these are borne on one-flowered peduncles, and are about the same size as in *S. zizyphoides*. The fruit in the present case is larger than described by Stapf, being more mature.

SYMPLOCOS ZIZYPHOIDES, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 205.

Kinabalu, in sheltered forest below Pakapaka, 9500′. Fl. Feb. 4257.

Distrib. Borneo (B. N. B. Kinabalu, 10,000′, *Haviland*).

A small tree, aromatic, with white flowers.

OLEACEÆ.

JASMINUM BIFARIUM, *Wall. Cat.* n. 2866.

Tenom, 900′, in sec. a forest, liane, general. Fl. Jan. 2684.

Distrib. Borneo (B. N. B. Sandakan, Kinabatangan, Tinkayu, *Creagh*). Malay Peninsula, Philippines ; Indo-China to India.

LIGUSTRUM ROBUSTUM, *Blume, Mus. Bot. Lugd.-Bat.* i. 313.

Mensangau, 2500′, a tree in sec. forest. Fl. (white) Feb. 3031.

Distrib. Malay Peninsula, Java, Sumatra ; Indo-China to India.

APOCYNACEÆ.

ERVATAMIA ORIENTALIS, *R. Br. Prod.* 468.

Tenom, 700′, in swampy sec. forest by railway. Fl. Fr. Jan. 2800.

Distrib. Borneo (B. N. B. Tamperuli, *Burbidge* ; Simporna, Gaya, *Creagh*). Timor, Timor Laut, New Guinea, and N.E. Australia.

White flowers, with exquisite scent. No latex.

PARSONSIA SPIRALIS, *Wall. Cat.* n. 1631 (1830).

Tenom, Rayoh hills, 2000′, in high forest. Buds, Jan. 2896.

Distrib. Borneo (B. N. B. Kudat, *Fraser* : Taganac, *Creagh* ; D. Borneo); Malay Peninsula, Java, Timor, and New Guinea ; Indo-China to India and Ceylon.

ASCLEPIADACEÆ.

HOYA CORONARIA, *Blume, Bijdr.* 1063.

Tambunan, 2000′, on swampy ground in sec. forest. Fl. Fr. Feb. 3002.

Distrib. Borneo (D. Borneo). Malay Peninsula, Sumatra.

A stout twiner on small trees, sending down curtains of long perpendicular shoots. Flowers green. Latex abundant.

LOGANIACEÆ.

BUDDLEIA ASIATICA, *Lour. Fl. Cochinch.* 72.

Tambunan plain, near Station, 2000′, in open waste land. Fl. Feb. 3013.

Distrib. Borneo (B. N. B. Kudat, *Fraser* : Kinabalu, Kadamaian, 2500′, *Haviland*). Malay Peninsula, Java, Timor, Moluccas, Ternate, and Philippines; Indo-China.

FAGRÆA RACEMOSA, *Jack in Roxb. Fl. Ind.* ii. (1824) 35.

Tenom, Rayoh hills, 1500′, in high forest. Fl. Jan. 2871.

Distrib. Borneo (B.N.B. North-East Coast, *Creagh* ; Sarawak ; D. Borneo). Malay Peninsula, Andamans, Java, Philippines, and New Guinea ; Indo-China.

A small tree, about 10 m. high, with handsome coriaceous leaves and light fawn-coloured flowers. Every inflorescence on this tree was infested with *Œcophila* ants which had, in many cases, fastened up the leaves, according to their custom, described by Beccari (**18**. 161), to protect the eggs and larvæ. The two opposite leaves, which subtend the inflorescence, are always chosen, and even when not actually gummed together, the edges curl up and enclose the inflorescence, whose peduncle and cymes evidently become modified and congested in response to some stimulus given by the ants, with the result that the sessile flowers are irregularly or often spirally arranged on a very short thickened and often pedunculate rhachis. In some specimens at the British Museum from the Malay Peninsula, and in Hose's 1078 from Matang Hill in Sarawak, the rhachis is so much swollen that it is quite deformed, and the same result is seen in one of Ridley's specimens in the British Museum. The calyces showed extra-floral nectaries, and in many of the flowers the reproductive organs had been eaten out.

FAGRÆA CRASSIPES, *Benth. in Journ. Linn. Soc., Bot.* i. (1857) 99.

Kaningau plain, in fringing wood on Baiaio river. Fl. Jan. 2974.

Distrib. Borneo (B.N.B. Linkabo, Labuk Bay, *Ridley* ; Labuan, *Motley*, *Hose* ; Sarawak). Philippines.

Small tree, 10 m., with pendent inflorescences and cream-coloured flowers.

GELSEMINUM SUMATRANUM, *Gibbs*, comb. nov. ; syn. *Lepidopteris sumatranum*, Blume, Mus. Bot. Lugd.-Bat. i. 240, fig. 34.

Tenom, 700′. Fl. Fr. 3130.

Distrib. Sumatra.

This plant was sent to me by A. B. C. Francis, Esq., Resident of the Interior, at Tenom, with the accompanying interesting note.

"The native name is 'Liman,' and it is the poison used by the Muruts for the purposes of suicide. The *modus operandi* is either to consume the older leaves mixed with other food, or to smoke the dried leaves mixed with tobacco, or to make an infusion and drink. As far as I can gather, the result is a period of drowsiness, and then unconsciousness and death after some hours. The plant is a small creeper, but attains sometimes to a considerable size."

Solereder (Pflanzenfam. iv. 2, p. 29) mentions that the root of *G. elegans*, Benth., is a favourite medium for poisoning in China.

GENTIANACEÆ.

Cotylanthera tenuis, *Blume, Bijdr.* 708.

Hills above Tenom, 2000′, saprophyte in high forest. Fl. Jan. 2906.

Distrib. Java.

Flowers light blue, growing amongst leaves at the base of a tree trunk. Dr. A. B. Rendle, to whom I am indebted for this determination, adds:— "This interesting little saprophyte has hitherto been known as a native of Java, and a full account of it is given by W. Figdor (in Annal. Jard. Buitenzorg, xiv. 213). The Bornean specimens show less tendency to branch and have somewhat larger flowers than those from Java, the calyx reaching 5 mm. and the corolla 10 mm. in length."

Exacum tetragonum, *Roxb. Hort. Beng.* 10.

Kaningau plain, near Station, 1000′, in open "Lalang" marsh. Fl. (bright blue). Fr. 2942. Fl. (white), Fr. Jan. 2943.

Distrib. Borneo (D. Borneo). Malay Peninsula, Java, Sumatra, Celebes, Philippines, and New Guinea; Indo-China, India.

Gentiana lycopodioides, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 208.

Kinabalu, granite core, 12,000–13,000′, cracks in granite. Fl. Feb. 4281, 4210. Between Kamburangau and Pakapaka, 8000–9500′, in the serpentine ridge association, on open rocks. Fl. Feb. 3129.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Whitehead*; 11,000′, *Haviland*).

A charming little spreading plant, with very dark green foliage and white flowers, more or less erect, growing in open sunny places and sending out long creeping branches where shaded; quite abundant. It seems to be chiefly distinguished from *G. quadrifaria*, Blume, the high mountain species of Java, by the absence of the larger radical leaves.

CONVOLVULACEÆ. (A. B. Rendle.)

Merremia nymphæifolia, *Hall. f. in Verslag. 's Lands Plantent.* 1895, 127.

Tenom, 700′, everywhere, over banks and trees. Fl. Jan. 2908.

Distrib. Borneo (B. N. B. Banggi, *Fraser*: Lahad Datu, *Creagh*; Sarawak). Malay Peninsula, Java, Celebes, Christmas Island, New Guinea, Polynesia, and Australia; S.E. Asia.

Lepistemon flavescens, *Blume, Bijdr.* 722.

Tenom, 700′, in the open near cultivation. Fl. Jan. 2624.

Distrib. Borneo (Sarawak; D. Borneo). Malay Peninsula, Java, Sumatra, Philippines; Indo-China.

Jacquemontia tomentella, *Hall. f. in Verslag. 's Lands Plantent.* 1895 (1896) 126.

Tenom, 700′, a scrambling liane, abundant everywhere. Fl. Jan. 2717.

Distrib. Borneo (Sarawak; D. Borneo). Sumatra.

"A beautiful scandent plant, of which the youngest branches may show a twining tendency. It forms dense masses over exposed low undergrowth, which are simply smothered in delicate rose-pink flowers that contrast charmingly with the silvery green leaves."

In the Kew herbarium are fruiting specimens showing valvate dehiscence of the capsule; examination of the pollen shows it to be tetrahedral and not spiny. These characters would exclude the species from *Lettsomia.*

Ipomœa cymosa, *Roem. & Schult. Syst.* iv. 241.

Tenom, 700′, railway-track to Melalap, in open. Fl. (white) Jan. 2840.

Distrib. Borneo (Labuan, *Motley*; Brunei, *i. e.* Brookton; Sarawak; D. Borneo). Java, Sumatra, Amboina, Timor Laut, New Guinea, and Philippines; Indo-China, India. Tropical Africa to Australia.

Quamoclit pinnata, *Boj. Hort. Maurit.* 224.

Apin Apin, 1500′, in clearing by rest-house. Feb. 2981.

Distrib. Java, Philippines, and New Guinea. Widely distributed in S.-East Asia and Malaya, South America, and tropical Africa.

SOLANACEÆ.

Solanum verbascifolium, *Linn. Sp. Pl.* 184.

Tenom, 700′, in native "kebuns." Fl. Fr. Jan. 2661.

Distrib. Borneo (D. Borneo). Tropics of both hemispheres.

Solanum torvum, *Sw. Prod. Veg. Ind. Occ.* 47.

Tenom, 700′, common in clearings and gardens. Fl. Fr. 2639.

Distrib. Borneo (D. Borneo). Throughout the tropics.

Solanum parasiticum, *Blume, Bijdr.* 697.

Tenom, Rayoh hills, 2500′, epiphytic in high forest. Fl. Jan. 3126.

Distrib. Borneo (Sarawak; D. Borneo). Malay Peninsula, Java, and Sumatra.

An epiphytic shrub, erect, with shiny, fleshy leaves and white flowers.

There is no authentic specimen of *S. parasiticum* at Kew or at the British Museum, but the plant agrees with King and Gamble's description (Fl. Mal. Pen. 330) in the parasitic habit, white flowers, and truncate calyx. It is represented from Sarawak at Kew (*Haviland* and *Hose*, 3711).

SCROPHULARIACEÆ.

TORENIA LAMPONGA, *Miq. Fl. Ind. Bat. Suppl.* 562.

Melalap, 800′, open clearings and Chinese gardens. Fl. (purple) Jan. 2723.

Distrib. Borneo (D. Borneo). Sumatra.

VANDELLIA CRUSTACEA, *Benth. Scroph. Ind.* 35.

Jesselton, sandy bog by the race-course, a general weed. Fl. Fr. Dec. 2604.

Distrib. Borneo (Sarawak; D. Borneo). General weed in the tropics.

VANDELLIA SCABRA, *Benth. Scroph. Ind.* 36.

Jesselton, sandy bog by the race-course. Fl. (white) Dec. 2605.

Distrib. Borneo (D. Borneo). Asia and tropical Africa.

VANDELLIA PEDUNCULATA, *Benth. Scroph. Ind.* 37.

Melalap, 800′, open clearing, drawn up amongst grass. Fl. Fr. Jan. 2729.

Distrib. Borneo (Labuan, *Motley*; Sarawak; D. Borneo). Tropical Asia.

Height 0·35–0·70 m., with fleshy leaves and mauve flowers with a yellow spot on the middle lobe of the lip.

SCOPARIA DULCIS, *Linn. Sp. Pl.* 116.

Tenom, 700′, a weed in old gardens, under fruit-trees. 2635. Melalap, 800′, on a sandbank in the Pengallan river. Fl. Fr. Jan. 2752.

Distrib. Borneo (B. N. B. Kudat, *Fraser*: Sandakan, *Creagh*; Sarawak). A general weed in the tropics.

EUPHRASIA BORNEENSIS, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 210, pl. 16 B. 10–16.

Kinabalu, between Kamburangau and Pakapaka, 8000–9500′, on the serpentine ridge. 3047. Open spaces in sub-summit dwarf forest. Fl. Feb. 4274.

Distrib. Borneo (B. N. B. Kinabalu, 8000–12,000′, *Haviland*).

One of the handsomest species of *Euphrasia*, with white flowers, recalling *E. Munroi*, Hook. f., of New Zealand in habit, and in the size of the white flowers, of which only one or two are out at the same time; however, it does not show the regular corolla of that species. It is erect in the open and on the summit, where it was not yet out, but assumes a prostrate habit in the shade of the Leptospermums and other trees of the ridge association.

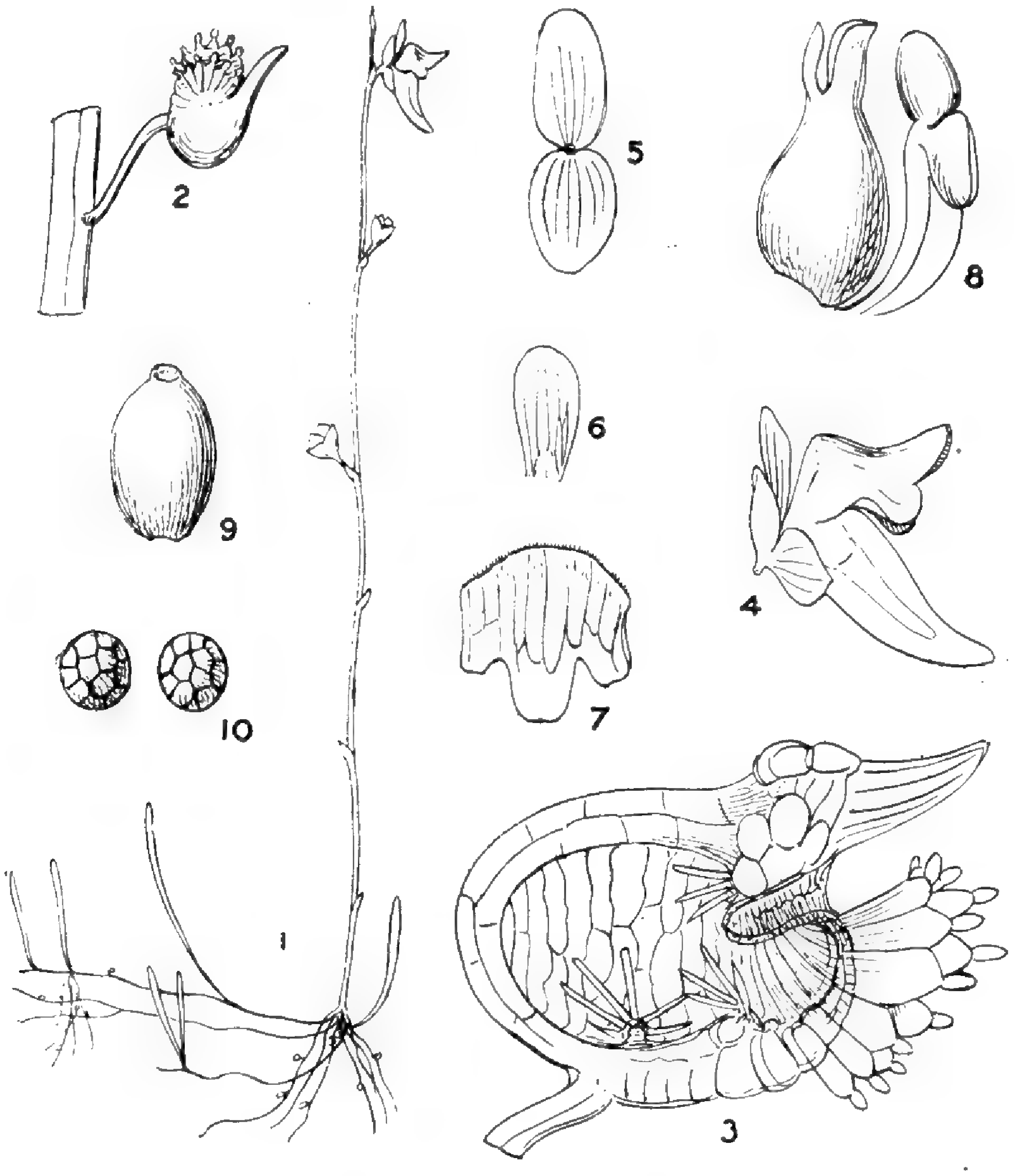
LENTIBULARIACEÆ. (O. Stapf.)

Utricularia bifida, *Linn. Sp. Pl.* 18.

Jesselton, near the race-course, in swampy land, on sandy soil, abundant. Fl. Fr. Jan. 2600.

Distrib. Borneo (D. Borneo). Malay Peninsula, Java, Philippines, W. Australia ; China and Japan ; India and Ceylon.

Fig. 6.



Utricularia calliphysa, Stapf. 1. Whole plant; 2. Part of rhizoid, with bladder, × 36; 3. Bladder, × 150; 4. Flower, × 6; 5. Calyx, × 6; 6. Upper lip of corolla, × 6; 8. Pistil and stamen, × 30; 9. Capsule, × 8; 10. Seeds, × 30.

Utricularia calliphysa, *Stapf*, sp. nov.; affinis *U. lateriflorœ*, R. Br., sed omnibus partibus minor, corollæ labio inferiore distincte trilobo et utriculi appendicibus distincta.

Plantula delicatula, circiter 4 cm. alta. *Stolones* et *rhizoidea* tenuiter

filiformia, alba, numerosa, ad caulium floriferorum bases orta, sparse minutissime glandulosa. *Folia* 1–2 ad caulium bases vel e stolonibus vel petiolis ipsis orta, spathulato-linearia, longe sensim in petiolum attenuata, obtusa, ad 7 mm. longa (sæpe multo minora), 0·5 mm. lata. *Utriculi* ex rhizoideis vel stolonibus orti, stipite filiformi æquilongo lateraliter insidentes, 0·3–0·4 mm. longi, subglobosi, parce glandulosi, labio superiore brevi corniformi erecto basi utrinque lobulo papilloso addito, labio inferiore (stipiti approximato) coronulam semicircularem stipitem versus apertam crenulatam in crenis glanduligeram referente. *Caules* floriferi filiformes, stricte erecti, 1–5 cm. alti, folia 3–4 squamiformia lineari-lanceolata acuta basifixa 0·5 mm. longa gerentes. *Flores* 1–4 dissiti, bracteis foliis præcedentibus simillimis suffulti; pedicelli vix 1 mm. longi, basi bracteolis 2 subulatis minutis instructi. *Sepala* æquilonga, 2 mm. longa, superius late oblongum, inferius suborbiculare, utrumque obtusum. *Corolla* pallide purpurea, labio superiore erecto obovato-oblongo subintegro 2 mm. longo, inferiore 3 mm. longo ore ascendente subquadrato 3-lobo, lobo intermedio paulo lateralibus longiore, calcare conico 5 mm. longo subacuto. *Filamenta* linearia, basin versus attenuata, 0·5–0·75 mm. longa. *Stigmatis labium* superius angustum, inferius æquans. *Capsula* matura ellipsoidea, 2 mm. longa. *Semina* subglobosa, laxe reticulata, lævia, 0·25 mm. diametro.

Hab. Jesselton, near the race-course, on sandy swampy land. Fl. Jan. 2601. Tambunan plain, in damp sandy soil, 2000′. Fl. Feb. 3015.

Distrib. Endemic in British North Borneo.

GESNERACEÆ. (Spencer Moore.)

Cyrtandra Gibbsiæ, *S. Moore*, sp. nov.

Caule crasso e cauli epigæo satis valido repente frequenterque radicellifero ascendente fulvo-villoso; *foliis* oppositis petiolatis obovatis vel late obovato-oblongis basin versus gradatim attenuatis basi ipsa obtusis margine undulatis pergamaceis supra glabris subtus fulvo-villosis; *floribus* paucis fasciculatis (vel interdum solitariis?) e cauli epigæo hac atque illac oriundis; *pedunculis* 0; *pedicellis* elongatis tenuibus fulvo-villosis; *calycis* fulvo-villosi tubo subcylindrico lobis inter se inæqualibus lineari-setaceis tubum subæquantibus; *corolla* calycem longe superante, tubo inferne angusto superne gradatim ampliato extus sparsim piloso-pubescente ore parum obliquo, lobis suborbicularibus tubo multo brevioribus; *ovario* oblongo et *stylo* tomentoso; *stigmata* biramoso; *bacca* oblonga styli basi persistente onusta.

Hab. Hills above Tenom, 2000′, undergrowth of high forest. Fl. Fr. Jan. 3113.

Stem about 30 cm. high, nearly 5 mm. in diameter, somewhat tumid at the nodes. Leaves about 14 cm. long (estimated, there being not one whole leaf) and 5–6 cm. broad, greyish above when dry and thickly sown with cystoliths,

tawny below; lateral nerves several, ascending, scarcely at all arcuate; petioles 10–15 mm. long, tawny villous. Pedicels 3–4·5 cm. long, with small subulate villous bracteoles about 2 mm. long at the base. Flowers white. Tube of calyx 8 mm. long, 3 mm. wide at the bottom and 4 mm. at the top; posticous lobes longer than the anticous owing to their higher connation, anticous 9 mm. long, the others 7–8 mm. Tube of the corolla about 3·5 cm. long, 3·5 mm. below and 8 mm. wide at the throat; lobes about 10 mm. long, 9–11 mm. broad. Ovary 10 mm. long. Style arms clavate, 3 mm. long. Berry up to 24 mm. in length.

The stamens and part of the style have been destroyed by insects, but there seems no reason to doubt that this is a *Cyrtandra*, close to *C. radiciflora*, C. B. Clarke, from which there is no difficulty in separating it on account, *inter alia*, of the long narrow calyx-lobes.

Æschynanthus Gibbsiæ, *S. Moore*, sp. nov.

Epiphytica, pendens; *foliis* oppositis breviter ovatis apicem versus angustatis obtusis basi subrotundatis margine undulatis coriaceo-incrassatis glabris; *floribus* binis (an semper?) in fasciculos axillares vel terminales pedunculatos dispositis; pedunculis pedicellisque pubescentibus; *calyce* majusculo cylindrico pubescente, lobis brevibus late triangularibus obtusis; *corollæ* majusculæ tubo ex calyce longe eminente superne incurvo mediocriterque dilatato extus pubescente, labio antico alte tripartito lobis late ovatis obtusissimis, labio postico breviter bilobo; *staminibus* leviter exsertis filamentis glabris; *ovario* glabro, stylum pubescentem magnopere excedente.

Hab. Gurulau spur, 3500′, above Kiau, in sec. forest. Fl. Feb. 3987.

Leaves 8–11 cm. long, 3·5–5·3 cm. broad; keel very prominent, lateral nerves but little visible; petiole 5–7 mm. long, channelled above. Peduncles to all appearance bearing a couple of flowers, stout, 7 to nearly 10 mm. in length. Pedicels about as long as the peduncles, but more slender. Calyx 2·5 cm. long, in width half as much, green in the fresh state, hairy on both surfaces, its lobes 3 mm. long and nearly 7 mm. wide at the base. Corolla red, up to 6 cm. long; the tube 6 mm. wide at the base, contracting soon for a short distance to 2 mm. or a little more, and then expanding to 8 mm.; lobes of the lower lip 10 × 8 mm.; upper lip 12 mm. long and about as broad, its suborbicular lobes 4 mm. in length. Anthers barely 3 mm. long. Disk 1·5 mm. high. Ovary with gynophore nearly 5 cm. long.

The only specimen seen was in flower, hence the section to which it belongs, and consequently the affinity must remain uncertain. It will probably prove nearly allied to *Æ. Rhododendron*, Ridl., which has smaller leaves, a deep purple calyx with acute glabrous lobes, a longer corolla with a glabrous tube and longer lobes as well as pubescent stamens.

DICHROTRICHUM ASPERIFOLIUM, *C. B. Clarke in DC. Monog.* v. I. 54.

Kinabalu, just below and around Pakapaka cave, 9500–10,000′, in low forest. Fl. Fr. Feb. 4245.

Distrib. Borneo (B. N. B. Kinabalu, 8000′, *Low*: 10,500′, *Haviland*; Sarawak). Java, Amboina.

A decumbent epiphyte, with brilliant red flowers.

ACANTHACEÆ. (SPENCER MOORE.)

THUNBERGIA FRAGRANS, *Roxb. Cor. Pl.* i. 47. t. 67.

Tenom, 700–800′, general everywhere in sec. forest and open clearings. Fl. Jan. 2617.

Distrib. Borneo (B. N. B. Pangkalan, Banggi, *Fraser*: East Coast, *Creagh*: Kinabalu, Kadamaian river, 2500′, *Haviland*; D. Borneo). Malaya and Philippines to N. Australia; Indo-China and India.

*STAUROGYNE AXILLARIS, *S. Moore*, sp. nov.

Herbacea, metralis; *caule* ascendente ramoso ramis foliosis pubescentibus; *foliis* lanceolatis obtusis basi in petiolum longum tenuem pubescentem angustatis membranaceis supra leviter scabriusculis utrinque in nervis pubescentibus puberulisve; *floribus* in racemos ex axillis oppositis oriundos subsessiles maxime abbreviatos perpaucifloros dispositis; *bracteis* lineari-subulatis calyce multo brevioribus ut inflorescentiæ axis calyxque patule pubescentibus; *calycis* segmentis inter se parum inæqualibus inferne oblongis superne longe extenuatis; *corollæ* tubo calycem circiter æquante sursum paullo ampliato extus puberulo lobis posticis quam antici paullulum majoribus, omnibus suborbicularibus fere glabris; *ovario* et *stylo* glabro.

Hab. Kinabalu, Gurulau spur, 3500′, above Kiau; sec. forest. Fl. Fr. Feb. 3991.

Blade of leaf generally 6–8 cm. long and 1·5–2 cm. broad, when dry dull olive-green above and brownish below; lateral nerves about 8 pairs, ascending; petioles 2–3 cm. long. Axis of inflorescence only about 3–4 mm. long, and apparently not lengthening in fruit; the whole raceme about 15 mm. long, and about the same in breadth. Bracts 4 mm. long; pedicels 1–2 mm. long. Flowers white. Segments of calyx very pale reddish when dry, 16·5–17·5 mm. long, at most 1 mm. broad. Tube of corolla somewhat curved a little above the base, 16·5 mm. long, rather more than 1 mm. broad at the bottom, expanding to 3 mm. above; posticous lobes of the limb 1·75 × 2 mm., anticous 1·5 × 1·8 mm. Anthers dehiscing by means of a rather long pore (anther-cell 1 mm. long, pore 0·5 mm.). Ovary 3·5 mm., style 10 mm. long; shorter arm of the stigma bifid. Capsule 6–7 mm. in length.

Differs from *S. lanceolata*, O. Kuntze, in habit, in the short axillary inflorescences, and the almost equal calyx-segments.

HYGROPHILA SAXATILIS, *Ridl. in Trans. Linn. Soc.* ser. 2. *Bot.* iii. (1893) 333.

Melalap, 800′, sandbanks in the Pengallan river. Fl. Jan. 2749.

Distrib. Borneo (Sarawak; D. Borneo). Philippines; Indo-China, Ceylon.

"Perennial, rooting at the nodes; aerial branches 14–28 cm. in height, with slightly fleshy leaves and blue flowers."

RUELLIA REPENS, *Linn. Mant.* i. 89.

Tenom, hills above, 1100′; undergrowth in sec. forest. Fl. Jan. 2868.

Distrib. Borneo (Sarawak; D. Borneo). Malay Peninsula, Java, Ceram, Tenimber Group, Philippines; Indo-China.

"Herbaceous, 0·75–1 m., with mauve flowers."

APORUELLIA BORNEENSIS, *S. Moore*, sp. nov.

Spithamea vel paullo ultra; *caule* stricto simplici vel pauciramoso inferne nudo superne ad apicem neque folioso pubescente cito glabrescente; *foliis* ovatis vel ovato-oblongis obtusis basi in petiolum brevem angustatis margine undulatis membranaceis utrinque præter costas minute pubescentes puberulasve atque marginem sparsim ciliolatum cito glabris; *axillis* superioribus paucifloris, floribus sessilibus; *bracteolis* oblongo-lanceolatis obtusis dorso puberulis margine ciliolatis calycem occludentibus facileque excedentibus; *calycis* alte divisi segmentis lanceolatis vel lineari-lanceolatis acuminatis margine ciliolatis; *corollæ* extus sparsim minuteque pubescentis tubo bracteolis æquilongo sursum ampliato, lobis late oblongo-obcordatis quam tubus brevioribus; *antheris* inclusis; *ovario* ellipsoideo fere glabro; *stylo* pubescente; *ovulis* quove in loculo 3; capsula 6-sperma inferne solida angustaque superne ellipsoidea acuta glabra.

Hab. Tenom, 900′, undergrowth in forests on the foothills. Fl. Fr. Jan. 2695.

Leaves 5–8 cm. long, 2·5–3·5 cm. broad, somewhat glaucous when dry; petioles ±6 mm. long, puberulous. Flowers up to about 6 in the axils, each leaving a prominent scar after falling. Bracteoles 10–15 mm. long, up to 3·5 mm. broad, like the leaves glaucous when dry. Calyx 5–7·5 mm. long, the segments somewhat unequal, 5–7 mm. in length. Tube of the mauve corolla 10–15 mm. long, 2–2·5 mm. in width below and 4–5 mm. in the upper two-thirds; lobes about 6·5 × 7 mm. Anthers narrow, apiculate, nearly 2 mm. long. Pollen-grains papillose. Ovary 2 mm., style 10–12 mm. long. Capsule 15 mm. long; seeds suborbicular, glabrous, 4 mm. in diameter.

Among other characters this differs from *A. axillaris*, C. B. Clarke, in the large bracteoles, the calyx, and the capsule.

HEMIGRAPHIS ALTERNATA, *T. Anders. in Journ. Linn. Soc., Bot.* vii. (1864) 114.

Near Melalap, 800′, undergrowth in sec. forest. Fl. Jan. 2796.

Distrib. Borneo (D. Borneo). Malay Peninsula, Java, Sumatra, and Philippines.

"Herbaceous, 0·51 m., with pale mauve flowers."

STROBILANTHES KINABALUENSIS, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 214.

Bundu Tuhan to Kiau, 2000–3000′, in open clearings and sec. forest. Fl. Feb. 3952.

Distrib. Borneo (Kadamaian river, 2000′, *Haviland*).

"Herbaceous, 2 m. in height, with white flowers. Also seen at Lobang rock, at 5000′."

STROBILANTHES GALEOPSIS, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 215.

Kinabalu, steep slopes above Lobang rock, 6000′, undergrowth in high forest. Fl. Feb. 4231.

Distrib. Borneo (B. N. B. Kinabalu, 5000–7000′, *Haviland*).

"Herbaceous, ± 1·40 m. in height, with reddish leaves and white flowers. Dr. Stapf compares the general habit of this plant with *Galeopsis Tetrahit* and *G. versicolor*, but in the field this resemblance was not suggested."

ACANTHUS EBRACTEATUS, *Vahl, Symb. Bot.* ii. 75, t. 40.

Jesselton, on the land edge of the mangrove swamp. Fl. Jan. 2606.

Distrib. Borneo (B. N. B. Tanjong Batu, *Creagh*). From tropical Africa to Polynesia and N. Australia.

"Also seen at Menkabong and on the Abai river. Flowers white."

LEPIDAGATHIS STAUROGYNOIDES, *S. Moore*, sp. nov.

Caule repente hac atque illac ramos foliosos glabros semispithameos vel minores emittente; *foliis* petiolatis oblongo-ovatis obtusis vel obtuse acutis basi obtusis rotundatisve firme membranaceis glabris; *floribus* in cymas brevissimas subsessiles perpaucifloras dispositis; *bracteis* calycis alte partiti segmentis similibus sed iis paullo latioribus anguste linearibus glanduloso-pilosis; *corollæ* extus fere glabræ tubo calycem æquante sursum amplificato, labio postico lato ovato breviter bilobo, labio antico ultra medium 3-lobo; *antheris* staminum breviorum loculis inæquialtis præditis, longiorum æquialtis; *ovario* et *stylo* glabro; *capsula* fere a basi 4-sperma.

Hab. Hills above Tenom, 1500′, undergrowth in high forest. Fl. Fr. Jan. 2873, 2902.

Leaves mostly 3–4·5 cm. long and 1·5–2 cm. broad, but often smaller, *e.g.* 25 × 13 mm., and occasionally only 13 × 10 mm., greyish green when dry, paler below; petioles 3–6 mm. long. Cymes only 2–3-flowered, including the corollas, at most 15 × 12 mm., but often shorter, the peduncle when present not more than 3 mm. in length. At the base of the inflorescence is a pair of floral leaves, linear-oblanceolate in form, about 6 mm. long by 1·5 mm. in width at the widest part; these like the bracteoles and calyx are glandular pilose. Bracteoles 8·5 mm. long, 8·5 mm. broad. Segments of calyx 8·5 mm. in length, narrowed above to about 0·2 mm. Flowers yellow; corolla-tube 8·5 mm. long, nearly 2 mm. wide in the lower half, thence suddenly expanding to 3 mm. and having at the throat a width of 5 mm.; upper lip 4 × 4·5 mm., its lobes subdeltoid, obtuse, less than 1 mm. in length; lower lip 4·5 × 5 mm., the middle lobe broadly ovate, very obtuse, 3 × 3 mm., the lateral lobes broadly oblong, very obtuse, 3 mm. long and nearly 2 mm. broad. Anthers oblong, 1·75 mm. long, the lower cell of the shorter pair of stamens only 1·25 mm. long. Pollen-grains, except for the smooth elliptical pore-areas, covered with an exceedingly fine meshwork-thickening. Ovary 1·75 mm., style 9 mm. long. Capsule with a very short hard point, 11 mm. long.

The *Staurogyne*-like general appearance and the few-flowered cymes seem to distinguish this species very easily.

JUSTICIA GENDARUSSA, *Burm. f. Fl. Ind.* 10.

Jesselton, on Bajow graves. Fl. Jan. 2608.

Distrib. Borneo (B. N. B. Sakatan river, *Burbidge*; Sarawak; D. Borneo). Malay Peninsula, Java, Babar, Timor, Philippines, and New Guinea; Indo-China to India.

A shrub, 1–2·50 m. high, with white flowers veined with mauve. General from Tenom to Kaningau, in secondary forest and by "campongs" up to 1000′. Mr. H. N. Ridley informs me that this plant is supposed to keep off ghosts and magic, and is consequently planted by the Malays on graves. He has never found it wild or in fruit. It is cultivated for medicine and remains long after traces of former cultivation have disappeared, and then looks as if native. It never seems to fruit, and he doubts it being wild in any locality visited by him in the Federated Malay States (Trans. Linn. Soc. ser. 2. Bot. iii. (1893) 333).

Miquel cites it as a native medicine (Fl. Ind. Bat. ii. 832). The Malay name is "Ganda Rusa."

C. B. Clarke (Hook. f. Fl. Br. Ind. iv. 532) questions it ever occurring wild, as it is so rarely found with seeds.

Ptyssiglottis (§ Anisophyllæ) Gibbsiæ, *S. Moore*, sp. nov.

Caule ascendente sparsim ramoso pubescente demum puberulo; *foliis* breviter petiolatis ellipticis apice longiuscule acuminatis basi obliquis brevissimeque cordatis membranacei præter costæ centralis faciem inferiorem prominentem minute pubescentem glabris, foliis minoribus parvulis lanceolatis quam majora multoties brevioribus; *floribus* in dichasia e ramo paullulum supra axillas oriunda satis longe pedunculata dispositis, inflorescentiæ axi et pedicellis et calycibus glanduloso-pubescentibus; *calycis* segmentis inter se subæqualibus anguste linearibus; *corollæ* tubo calycem excedente deorsum angustato sursum cylindrico extus minute puberulo, lobis posticis labiique antici lobis lateralibus late oblongis obtusis, hujus lobo intermedio semiorbiculari; *antherarum* loculis inæquialto affixis; *pollinis* granis 3-porosis costulis difficile aspectabilibus; *ovario* oblongo-ovoideo et *stylo* glabro.

Hab. Near Tenom, 700′, undergrowth in secondary forest. Fl. Jan. 2931.

Leaves 12 cm. long, 4·5–6 cm. broad, pale green when dry; cystoliths very numerous on either face; lateral nerves prominent below, the lower ascending, the upper very openly arched; petioles 7 mm. long; small reduced leaves 4–10 mm. long. Peduncles mostly 10–15 mm. long; bracts minute, subulate, about 1 mm. in length; pedicels ±5 mm. long. Flowers cream-coloured. Calyx-segments 7–8 mm. long. Moistened corolla 19–21 mm. long, the tube 16 mm. in length by 2 mm. in width below, and 3·5 mm. above; lobes of upper lip 5×2 mm., middle lobe of lower lip 3×4·5 mm.; palate very intrusive. Upper cell of anther 2 mm. long, lower slightly shorter. Disk fleshy, rather more than 1 mm. high. Ovary 2 mm., style 16 mm. long.

Separable at sight from *P. procridifolia*, Hallier f. and *P. frutescens*, Hallier f., by the indumentum, the cordate base of the leaves, and the long peduncles.

No. 2924 (from Tenom, undergrowth in secondary forest) apparently belongs here, but the leaves are much smaller, viz. 6–7×2·5–3 cm. and even less, indeed sometimes no more than 3 cm. in length. The flowers are noted as yellow.

Hypoestes floribunda, *R. Br. Prod.* 474.

Tenom, 800–900′, foothills, in undergrowth in sec. forest. Fl. Jan. 2619.

Distrib. Borneo (B. N. B. Banggi, *Fraser*). Timor Laut, Little Kei Island, Philippines, and N.E. Australia.

"Herbaceous, 2 m. in height, with purple flowers."

VERBENACEÆ.

Callicarpa cana, *Linn. Mant.* ii. 198.

Tenom, 700′, in "kebuns" and in forest. Fl. Jan. 2669.

Distrib. Borneo (B. N. B. Tanjong Batu, *Creagh* ; D. Borneo). Malay Peninsula, Java, Sumatra, Timor, Timor Laut, Sunda, Philippines, and N.E. Australia ; Indo-China.

Also seen in a bog at Jesselton.

GMELINA ASIATICA, *Linn. Sp. Pl.* 626.

Sapong, 700–900′, everywhere in open clearings. Fl. Jan. 2719.

Distrib. Malay Peninsula and general in the Dutch Indies ; Indo-China, East India and Ceylon.

VITEX PUBESCENS, *Vahl, Symb. Bot.* iii. 85.

Tenom, 700–900′, common in sec. forest. Fl. Fr. Jan. 3132. Tambunan plain, 2000′, in open dry places. Fl. Fr. Feb. 3012.

Distrib. Borneo (B. N. B. Kudat, *Fraser* : Tawao, *Creagh* ; Sarawak ; D. Borneo). Malay Peninsula, Java, Sumatra, Timor, Wetter, and Philippines ; Indo-China, India and Ceylon.

Tree, 20 m., with dark massive foliage and dense racemes of mauve flowers. Motley notes on a specimen from Banjarmassing (at "the flowers are white and that the plant is very common, and one of the toughest woods in existence. The bark is used for dyeing rotans, the Malay name being 'Alahan'." At Tambunan it was seen as a shrub, ±4 m.

CLERODENDRON BETHUNEANUM, *Low ex J. Smith in Bot. Mag.* t. 4485.

Tenom, 700′, near native cultivation and in sec. forest, general. Fl. Fr. Jan. 3131.

Distrib. Borneo (B. N. B. Pulo tiga, *Burbidge* : Pangkalan, Banggi, *Fraser* : Sarawak ; D. Borneo).

A magnificent species, with a large panicle of red flowers terminating each branch. It was seen flowering when only 0·75 m. high, but attains up to 6 m. in the forest. Each flower has a white spot on the lip ; the fruit is blue.

CLERODENDRON INFORTUNATUM, *Gaertn. Fruct.* i. 271.

Ghinambur, 500′, a tree in sec. forest. Fl. (white) Fr. Feb. 4289.

Distrib. Malay Peninsula, Java, Moluccas ; Indo-China, India and Ceylon.

CLERODENDRON KINABALUENSIS, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 216.

Kinabalu, 5000′, Gurulau spur, in high forest undergrowth. Fl. Fr. 3978.

Distrib. Borneo (B. N. B. Kinabalu, Penokok river, 3200′, *Haviland*).

A scrambler, with large white flowers, slightly scented.

LABIATÆ.

OCIMUM BASILICUM, *Linn. Sp. Pl.* 597.

Tambunan Station, 2000′, near "kedehs." Fl. Fr. Feb. 3016.

Distrib. Java, Timor, Moluccas, Philippines, and New Guinea. Tropics generally, also cultivated.

ORTHOSIPHON STAMINEUS, *Benth. in Wall. Pl. As. Rar.* ii. 15.

Apin Apin, 1500′, near the rest-house. Fl. Feb. 2980.

Distrib. Borneo (D. Borneo). Malay Peninsula, Java, Philippines and New Guinea to N.E. Australia ; Indo-China to N.E. India.

HYPTIS BREVIPES, *Poit. in Ann. Mus. Par.* vii. (1806) 465.

Tenom, 700′, common weed in "kebuns" and on paths, also in the forest. Fl. Jan. 2676.

Distrib. Borneo (B. N. B. Sandakan, *Creagh* : Labuan, *Motley* ; D. Borneo). Malay Peninsula, Andamans, Java, Celebes, Timor, Amboina, Philippines. Tropical; indigenous in tropical America.

DYSOPHYLLA VERTICILLATA, *Benth. in Wall. Pl. As. Rar.* i. 30.

Kaningau plain, in "Lalang" swamp. Fl. Fr. Feb. 2968.

Distrib. Philippines, N. Australia; China, Japan, Indo-China to E. India and Ceylon.

AMARANTACEÆ.

CYATHULA PROSTRATA, *Blume, Bijdr.* 549.

Tenom, 700′, in "kebun" paths. Fl. Jan. 3134.

Distrib. Borneo (B. N. B. Tawao, *Creagh* : Labuan, *Motley* ; D. Borneo). Malay Peninsula, Java, Sumatra, Lombok, Philippines, and New Guinea. Tropics generally.

Flowers pink.

ALTERNANTHERA SESSILIS, *R. Br. Prodr.* 417.

Melalap, 800′, sandbank in Pengallan river. Fl. Fr. 2755.

Distrib. Borneo (Sarawak ; D. Borneo). Malay Peninsula, Java, Philippines, and New Guinea. Generally distributed in warm countries.

POLYGONACEÆ.

*POLYGONUM CHINENSE, *Linn. Sp. Pl.* ed. 2, 520.

Bundu Tuhan, 2000′, damp wet places in young jungle. Fl. Feb. 4315.

Distrib. Borneo (B. N. B. Tampussuk river, 2500′, *Haviland*). Malay

Peninsula, Java, Sumatra, Timor, and Philippines ; Japan, China, India and Ceylon.

Also seen at Kiau and Lobang rock, at 5000′.

Polygonum flaccidum, *Meissn. in DC. Prod.* xiv. 107.

Tenom, 700′, in open damp places. Fl. Jan. 2845.

Distrib. Borneo (Sarawak ; D. Borneo). Malay Peninsula, Java ; Indo-China to India.

NEPENTHACEÆ. (J. Macfarlane.)

Nepenthes ampullaria, *Jack in Comp. Bot. Mag.* i. (1835) 271.

Tambunan plain, near the Station, 2000′, in open scrub on sandy soil, running up shrubs and grass. Young plant. Aerial pitchers not developed. 2994 *a*. ♀. Feb. 2994 *b*.

Distrib. Borneo (Labuan, *Burbidge* ; Brunei ; Sarawak ; D. Borneo). Malay Peninsula, Sumatra, and New Guinea.

Nepenthes tentaculata, *Hook. f. in DC. Prod.* xvii. (1873) 101.

Kinabalu, Maraiparai spur, 5000–7000′, in open serpentine formation up to the mossy forest, abundant. Aerial pitchers, 4078 *a*. Radical pitchers, 4078 *b*. Feb. (from same plant).

Distrib. Borneo (B. N. B. summit of Lobang, 5000′, N.E. coast of Borneo, *Lobb* : Kinabalu, 9000′, *Low* ; Sarawak).

"Lobb, in 1853, ascended as far as the Lobang rock on Kinabalu, but did not get further as the natives refused to accompany him ; that is therefore possibly the locality given on many of his specimens as 'Lobang Peak.' The dark red pitchers of this plant are very characteristic on the usual route up the mountain by the South-Western spur and also on the Maraiparai spur to the N.W."

Nepenthes tentaculata, var. tomentosa, *Macfarl. in Engl. Pflanzenr.* iv. iii. (1908) 43.

Kinabalu, Kamburangau ridge to Pakapaka, 7000–10,000′, in mossy forest and on the open serpentine formation, abundant. Feb. 4217 (aerial pitchers only).

Distrib. Borneo (B. N. B. Kinabalu, 6000–9000′, *Burbidge*).

This form is a hairy variety which seems, judging from the present collection and that made by Burbidge, to inhabit a higher zone than that usually occupied by the typical form. As the pitchers are richly covered in the young state and often even at maturity with a dense ferruginous tomentum, I have referred it to *N. tentaculata* var. *tomentosa*. Whether this is a feature

that has developed to enable the plant to adapt itself to the more severe climatic surroundings of a higher mountain zone, is a question that cannot now be determined, but which deserves to be kept in view by future travellers.

NEPENTHES VILLOSA, *Hook. f. Ic. Pl.* t. 888 (1852).

Kinabalu, between Kamburangau and Pakapaka, 8000–9000′, in mossy forest and open scrub on serpentine. ♂ ♀. Feb. 4286.

Distrib. Borneo (Kinabalu, 7500–9000′, *Low*, *Burbidge*, *Whitehead*).

NEPENTHES EDWARDSIANA, *Hook. f. in Trans. Linn. Soc.* xxii. (1859) 420, t. 70.

Kinabalu, Maraiparai spur, 5000′, epiphytic in mossy forest, abundant. Feb. 4083.

Distrib. Borneo (B. N. B. North end of Kinabalu, 5000′, *Low*; *Burbidge*).

"Judging from the label on Sir Hugh Low's specimen at Kew, his locality is undoubtedly the Maraiparai spur. This species is also abundant as one emerges from the mossy forest on to the Kamburangau ridge, at 7–9000′ on the South-Western spur, which is Burbidge's locality."

NEPENTHES GRACILIS, *Korth. in Verh. Nat. Gesch. Bot.* (1839) 22. t. 1 et t. 4, f. 1–38.

Tambunan plain, near the Station, 2000′, running up amongst grass and shrubs, in open scrub on sandy soil, abundant. Feb. ♀. 2993 *a*. Aerial pitchers, 2993 *b*.

Distrib. Borneo (B. N. B. Balambangan Island, *Creagh*: Sipitang, *Woolley*, fide phot. Brit. Mus.; Labuan, *Burbidge*; Brunei; Sarawak; D. Borneo). Malay Peninsula, Sumatra, Billiton.

Also abundant at Jesselton and Usakan, on exposed sandstone.

NEPENTHES RAFFLESIANA, *Jack in Comp. Bot. Mag.* i. (1885) 270.

Tambunan plain, near Station, running up grass and shrubs in open scrub on dry sandy soil, abundant. Feb. ♂ with aerial pitchers, 2995 *a*. Radical pitchers, 2995 *b*.

Distrib. Borneo (B. N. B. Balambangan Island, *Fraser*: Port Myburgh, *Creagh*: Sipitang, *Woolley*, fide phot. Brit. Mus.; Labuan, *Burbidge*; Brunei). Malay Peninsula, Sumatra, Billiton. (Philippines, *Cuming*, Brit. Mus.)

*NEPENTHES BOSCHIANA, *Korth. in Verh. Nat. Gesch. Bot.* (1839) 25. t. 2 et 4, f. 39–54.

Kinabalu, Maraiparai spur, 5500–7000′, epiphytic in mossy forest. Feb. 4077. Young plant, 4077 *a*.

Distrib. Borneo (Brunei; Sarawak; D. Borneo).

NEPENTHES LOWII, *Hook. f. in Trans. Linn. Soc.* xxii. (1859) 420, t. 71.
Kinabalu, Maraiparai spur, 5000–7000′, in mossy forest. Feb. 4084.
Distrib. Borneo (B. N. B. Kinabalu, 6000–8000′, *Whitehead*; down to 5000′, *Burbidge*).

"Also abundant from the mossy forest on the South-Western spur to above Kamburangau, 7000–8000′. This species is similar in habit to *N. Edwardsiana*."

*NEPENTHES sp.
Kinabalu, above Kamburangau, 8000–9000′, in mossy forest and on the open olivine serpentine formation. Feb. 4300′. (Pitcher only.)

All available morphological details suggest that this is a hybrid between *N. villosa* and *N. Rajah*. Of this form only one pitcher was collected. At first sight it resembles rather closely a marked variety of *N. villosa*. But in collecting it Miss Gibbs was struck by the peristome, which was greatly more expanded than is typical of that species. A detailed study has caused me to view it as almost surely a hybrid between *N. villosa* and *N. Rajah*. Though the latter species was not observed during the ascent, it is one of the celebrated types peculiar to the mountain, and specially to the high zone where *N. villosa* grows. It might well therefore contribute to the origin of the present specimen, since cross-pollination by insects is typical for *Nepenthes*. Alike in the shape of the pitcher and of the peristome ridges and teeth, in the shape and distribution of the honey-glands of the lid, in the very shallow conducting surface, in the glistening circular zone round the upper part of the detentive surface (that is alone represented, though wider, in the species *N. villosa*), also in the distribution and shape of the glands of the detentive surface, it exhibits characters that are evidently compounded from both species already named. When we remember that Burbidge has already described *N. Harryana* [Gard. Chron. n. s. xvii. (1882) 56] as a natural hybrid between *N. villosa* and *N. Edwardsiana*, which I have found in its minute structure to confirm such a conclusion, it seems not unlikely that the specimen now under discussion may also have a hybrid origin. We hope to learn more in the future regarding such suggestive and at times puzzling forms.

PIPERACEÆ. (C. DE CANDOLLE.)

PIPER, *Linn.*

PIPER BETLE, *Linn.*, var. SIRIBOA, *C. de Cand. in Prod.* xvi. I. 359.
Tenom, 700′, in sec. forest. Fl. Jan. 2847.
Distrib. Java; India and Ceylon.
"Siri utan" of the natives.

Sectio EUPIPER, *C. DC.*

*PIPER AMPHIBRACTEUM, *C. de Candolle*, sp. nov.

Ramulis costulatis glabris ; *foliis* longe petiolatis glabris, superorum limbo elliptico-lanceolato basi inæquilatera vel interdum æquilatera utrinque acuto apice acute attenuato, 9-nervis nervo centrali nervos adscendentes utrinque 2 emittente quorum supremus a 3·5–4 cm. supra basin solutus, nervis lateralibus utrinque 2 a basi solutis quorum externus aliis multo tenuior et brevior, petiolo glabro basi vaginante ; *pedunculo* glabro petiolum superante ; *spica* quam limbus adultus pluries breviore, rhachi glabra, bracteæ pelta glabra in longitudinem elliptica subtus late sessili ; *ovario* glabro ovato, stigmatibus 3–5 linearibus recurvis ; *bacca* estipitata submatura ovata basi et apice attenuata.

Hab. Kinabalu, slopes above the Lobang rocks, 6000′, high forest. Fl. Fr. Feb. 4126, 4130.

Dioicum, epiphytum. Ramuli spiciferi usque ad 4 mm. crassi ; collenchyma haud libriforme in fasciculos discretos in costulis ramuli dispositum ; fasciculi intramedullares 1-seriati ; canales lysigenus centralis pluresque peripherici. Limbus folii rigido-membranaceus, creberrime pellucido-punctulatus, usque ad 14 cm. longus et 9·5 cm. latus. Petiolus usque ad limbi latus longius 20 mm., inter limbi latera 5 mm. longus. Pedunculus usque ad 5·5 cm. longus. Spica submatura 4·5 cm. longa. Bracteæ pelta 3 mm. longa, 2 mm. lata. Bacca submatura 8 mm. longa, in sicco nigra.

PIPER STYLOSUM, *Miq. in Ann. Bot. Mus. Lugd.-Bat.* i. 139.

Tenom, Rayoh hills, 2500′, undergrowth in high forest, abundant. Fl. Jan. 2887.

Distrib. Malay Peninsula, Sumatra.

Epiphyte, 0·70–1 m. altum.

PIPER SARMENTOSUM, *Roxb. Fl. Ind.* 162.

Tenom, 700′, in round "campongs" and on old "kebun" land, abundant. ♀. Fr. Jan. 2640.

Distrib. Borneo (Sarawak ; D. Borneo). S. China, through Malaya to India.

Erect, 0·70 m. altum.

PEPEROMIA, *Ruiz et Pavon.*

*PEPEROMIA DECUMBENS, *C. de Candolle*, sp. nov.

Caule filiformi dense puberulo ; *foliis* alternis modice petiolatis, limbo oblongo-elliptico basi attenuato et acuto apice obtuso 3-nervio nervuloque marginali ab apice usque ad medium decurrente utrinque petioloque sat dense puberulis ; *pedunculis* glabris axillaribus terminalibusque petiolos fere æquantibus ;

spicis glabris limbos fere æquantibus; bracteæ pelta rotunda centro subsessili; *filamentis* sat longis, antheris ellipticis; *ovario* rhachi impresso turbinato apice in medio stigmatifero, stigmate carnoso glabro; *bacca* globosa glandulis asperulata sine pseudocupula.

Hab. Kinabalu, slopes above Lobang rock, 6000′, high forest. Fl. Fr. 4125.

Herba epiphyta decumbens. Caulis 10 cm. longus. Limbus in sicco membranaceus, minute pellucido-punctulatus, usque ad 4 cm. longus et 1·8 cm. latus. Petiolus 5 mm. longus. Bracteæ pelta sub 0·5 mm. diam. Bacca 0·75 mm. diam., rhachis processu conico sublevata.

CHLORANTHACEÆ.

CHLORANTHUS OFFICINALIS, *Blume, Enum. Pl. Jav.* 79.

Melalap, near, 800′, undergrowth in sec. forest. Fl. Fr. Jan. 2846.

Distrib. Borneo (Sarawak). Malay Peninsula, Java, Sumatra, Philippines, and New Guinea; Indo-China to Andamans.

CHLORANTHUS BRACHYSTACHYS, *Blume, Fl. Jav.* Fasc. 13–14, t. 2.

Kinabalu, slopes above Lobang rock, 6000′, in high forest undergrowth. Fl. Fr. Feb. 4122.

Distrib. Borneo (B. N. B. Kinabalu, 6000′, *Haviland*). Malay Peninsula, Java, Philippines; Japan; Indo-China to India and Ceylon.

MYRISTICACEÆ.

MYRISTICA GLAUCA, *Blume, Bijdr.* 576.

Tenom, 700′, in marshy sec. forest, by the railway. ♀. Jan. 2803.

Distrib. Borneo (Sarawak). Malay Peninsula, Java, Sumatra, Banka, Philippines; Andamans and Nicobars.

Flowers orange, densely covered on the outside with an orange-brown tomentum.

LAURACEÆ.

*ACTINODAPHNE FOXWORTHYANA, *Gibbs*, sp. nov.

Arbor parva. *Ramuli* graciles, glabri, innovationes et petioli juniores villosuli. *Folia* graciliter petiolata, 3–5-na verticillata, elliptico-oblonga, apice acuminato ipso obtusiuscula, basi cuneata, tenuiter coriacea, adulta glaberrima, supra fusco-brunnea, subtus subglaucescentia, nervis lateralibus 4–6 arcuato-erectis, supra arctissime reticulata rete maxime prominente, infra nervis reteque parum perspicuis. *Flores* ♂ fasciculati breviter pedunculati, dense flavo-sericei.

Hab. Kinabalu, 10,000′, Pakapaka cave, in sheltered scrubby forest. ♂. Feb. 3135.

The leaves of this plant are rather striking, being dark brown and finely reticulate on the upper side, while as to the under, they may be described as waxy glaucous, showing a perfectly smooth surface; the largest leaf is 9 cm. long and 3·6 cm. broad, with a petiole 1 cm. long. The ♂ flowers are 2–4 in involucrate clusters, the number of bracts to the involucre being 6. The pedicels of the ♂ flowers are 3 mm. long and densely villous, the perianth-tube very short, with segments 5 mm. long; there are 9 stamens, with hairy filaments 5 mm. long, and 2 basal glands 1 mm. long. The flowers show an aborted densely villous ovary 3 mm. long.

This species is nearest to *A. borneensis*, Meissn., collected in Labuan by Motley, but it differs in the shape of the leaves, which are not so long attenuated at the base and apex, in the markedly distinct areolation on the upper surface of the leaf, which might almost be described as pitted, and in the larger flowers.

This plant is named after Dr. Foxworthy, of the Manila Bureau of Science, who ascended Kinabalu in March 1910, and who very kindly placed the excellent photographs he then obtained at my disposal.

LITSEA CITRATA, *Blume, Bijdr.* 565.

Between Apin Apin and Tambunan, 3000′, in sec. forest. Fl. Feb. 2989.

Distrib. Java, Sumatra; China and East Himalayas.

Tree, with coriaceous leaves, shining on the upper surface and lighter underneath. Flowers light yellow.

LITSEA ZEYLANICA, *C. & Fr. Nees in Amœn. Bot. Bonn.* Fasc. i. 58, t. 5, ex *Nees, Syst. Laur.* 628.

Kinabalu, Kamburangau, 7500′. ♀. Feb. 4156.

Distrib. Borneo (B. N. B. Kinabalu, 8000′, *Haviland*). Malay Peninsula; India and Ceylon.

LITSEA (§ Cylicodaphne) OPPOSITIFOLIA, *Gibbs*, sp. nov.

Arbor. Ramuli teretes, juniores ut innovationes ferrugineo-tomentelli. *Folia* opposita, obovato-oblonga, obtusa vel breviter acuminata, basi cuneata, rigide coriacea, glabra, in sicco griseo-viridia, subtus pallida, nervis lateralibus 9–11, venis subtus prominulis, venulis laxe reticulatis; petioli crassiusculi, glabri. *Capitula* parva, pedunculata, in axillis glomerata, 4-flora; involucrum 3–4-phyllum, villosum. *Flores* ♂ pedicellati, villosi.

Hab. Tenom, Rayoh hills, 2000′, in old sec. forest. ♂. Jan. 3136.

This plant is very distinct from the known species of *Litsea* in its large opposite leaves, which are coriaceous and shining on the upper surface when

living, but dull brown in colour in the dried condition ; on the underside the surface is bluish glaucous, the reddish veins standing out conspicuously. The largest leaf is 1·9 dm. long, 8·2 cm. broad, the petiole being 1 cm. long. The 3–4-flowered small pedunculate capitula are aggregated in the axils of the leaves ; the peduncles, with the bracts of the involucre, are densely villous, the latter being unequal in size and 3–4 in number. The ♂ flowers are white, pedicellate and 4 mm. long, the perianth-tube villous, both inside and outside, the segments unequal in number, usually 6 or more, glabrous and flecked. The stamens vary from 6–12 with villous filaments, 4–5 mm. long, the outer ones being biglandular at the base, while the internal are often smaller and may be obsolete.

PROTEACEÆ.

*Helicia Maxwelliana, *Gibbs,* sp. nov.

Arbor parva, glaberrima. *Folia* alterna, sessilia, crasso-coriacea, obovato-oblonga, obtusiuscula, integerrima, basi cordata, costa media maxime incrassata, costis lateralibus 8–9, supra nitida, subtus opaca, reticulo optime perspicuo. *Racemi* sessiles, extra-axillares, quam folii breviores ; pedicelli solitarii vel 2–4 gemini, basi parvibracteati. *Alabastra* ellipsoideo-rotundata, basi dilatata.

Hab. Kinabalu, Maraiparai spur, 5000–6000′. Fl. Feb. 3137.

The leaves of this species are unusually large, measuring 1·5–1·7 dm. in length and 7·5–9 cm. across ; in the dried condition they are yellow-green in colour, the tertiary veins showing marked reticulation, less pronounced on the dull brown lower surface. The cylindrical racemes are cauline, 1·5 dm. in length, shorter than the leaves, the sweet-scented white flowers occurring singly or in groups of 2–4 up the rhachis. The pedicels are 5 mm. long, hirsute at the base and invested with minute villous and caducous bracts. The buds are 8 mm. long. The flowers show 4 hypogynous scales connate at the base and ovate in shape, surrounding a sessile and glabrous ovary.

This plant occurred abundantly as a small tree of fastigiate habit, on the Maraiparai spur at 5500′ in the dense forest scrub bordering the open part. Higher up at 6000′, it forms a close association as a fringe to the mossy forest which clothes the sheltered slopes abutting on the precipices of the granite core.

This species is very distinct from the other species of *Helicia* in the sessile very thick, markedly oblong and obtuse leaves with cordate auriculate bases, and in the cauline inflorescence.

THYMELÆACEÆ.

WIKSTRŒMIA RIDLEYI, *Gamble in Kew Bull.* (1912) No. 4, 200.

Jesselton, in young open jungle. Fl. Dec. 2590.

Distrib. Malay Peninsula.

I am indebted to Mr. H. N. Ridley for this determination.

DRAPETES ERICOIDES, *Hook. f. in Hook. Ic. Pl.* t. 895.

Kinabalu, 13,000′, on summit, in cracks in granite, abundant. Fl. Feb. 4180, 4203.

Distrib. Borneo (B. N. B. Kinabalu, 12,000′ to top, *Low*; *Haviland*). New Guinea, Mt. Scratchly and Mt. Knutsford.

LORANTHACEÆ.

*LORANTHUS (§ Heteranthus) MAXWELLIANUS, *Gibbs*, sp. nov.

Ramuli teretes, cinerascentes. *Folia* opposita, petiolata, obovata, basi elliptica vel oblonga, apice rotundata vel attenuata obtusiuscula, integerrima, coriacea, evenia, adulta costa media exempta glabra. *Racemi* axillares et terminales, fastigiati, stricti, juniores cum floribus rufo-furfuracei, pulverulenti, cito glabrescentes, 13–20-flori. *Flores* sparsi vel subverticillati, sessiles, basi bracteola naviculari acutiuscula tomentella stipati. *Calyx* cylindraceus, rufo-tomentellus, limbo producto patulo integerrimo. *Alabastra* teretia, acutiuscula, recta, 5-mera; *stylus* filiformis, sulcatus, stigmate capitellato.

Hab. Kinabalu, Gurulau spur, 5500′, in high forest. Fl. Feb. 4006.

The leaves of this specimen are long-petiolate, with petioles 10 mm. long, and blades oblong-elliptic in shape, tapering from about the middle to a blunt acumen, though some are quite rounded at the apex; they vary from 5·8 cm. in length and 3·7 cm. in breadth, and show the midrib conspicuous for its whole length on the under side but only indicated on the upper. The racemes are erect, 5 cm. long, shorter than the leaves and red, including rhachis, calyx, and perianth. The calyx is 4 mm. and the perianth 7 mm. long. The 5 stamens are shorter than the lobes of the perianth, with linear anthers 3 mm. long. The ovary is 3 mm. long, furfuraceous, with style and capitate stigma 6 mm. long.

This plant is easily distinguished from *L. heteranthus*, Wall., by the opposite leaves, the racemes shorter than the leaves, and the much smaller and sessile flowers. *L. heteranthus* is described as a shrub in Koorders and Valeton's 'Excursions Flora von Java,' p. 159. The above species is noted as a "tree, flowers red," in my field note-book. This species would come into the Section *Loranthobotrys*, Engl., and the genus *Coleobotrys*, van Tieghem.

Loranthus sabaënsis, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 222.

Kinabalu, 11,000′, in sub-summit dwarf forest. Fl. Feb. 4201.

Distrib. Borneo (B. N. B. Kinabalu, 8000′, *Low* : 11,000′, *Haviland* ; Sarawak).

Epiphytic on *Leptospermum recurvum*, also seen at Papapaka cave on *Rhododendron ericoides*. Flowers yellow, about four to the head on this specimen

Loranthus centiflorus, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 222, pl. 18 c. 9–10.

Tambunan plain, 2000′, near the Station, on a bush in open scrub. Fl. Feb. 3011.

Distrib. Borneo (B. N. B. Kinabalu, 6000′, *Haviland*).

Flowers red.

BALANOPHORACEÆ.

Balanophora Lowii, *Hook. f. in Trans. Linn. Soc.* xxii. (1859) 426, t. 75 c.

Kinabalu, Maraiparai spur, 5500′, in mossy forest. ♂. Feb. 3138. Gurulau spur, 4500′, in high forest. 4022.

Distrib. Borneo (B. N. B. Kinabalu, in shady woods, *Low*).

A parasite on the roots and bases of trunks of trees, occurring in masses. The whole plant is of a brown colour, but the rhizome remains small and distinct.

Balanophora elongata, *Blume, Enum. Pl. Jav.* i. 87.

Kinabalu, Maraiparai spur, 5500′, in high forest. ♂. Feb. 4028. ♀. 4029.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*).

A parasite on the roots of trees, abundant. ♂ and ♀ plants both equally distributed, often forming large masses of rhizome.

EUPHORBIACEÆ. (J. Hutchinson.)

Euphorbia hypericifolia, *Linn. Sp. Pl.* 454.

Melalap Estate, 800′, in open places, everywhere. Fl. Fr. Jan. 2731

Distrib. Borneo (D. Borneo). A common tropical and subtropical weed.

Phyllanthus Urinaria, *Linn. Sp. Pl.* 982.

Melalap Estate, and also on sandbanks in the Pengallan river. Fl. Fr. 2744.

Distrib. A common weed in the tropics.

GLOCHIDION LITTORALE, *Blume, Bijdr.* 585.

Usakan Bay, seashore. Fl. Fr. March. 4330. Seen also at Labuan, Jesselton, and Tenom.

Distrib. Borneo (B. N. B. without precise locality, *Burbidge*; Brunei; Sarawak). Banka Island, Sumatra, Java; India.

DAPHNIPHYLLUM BORNEENSE, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 224.

Kinabalu, forest-clad ridges and slopes above Kamburangau to Pakapaka, 7000–10,000′. ♂. Feb. 4170.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*).

Tree about 10 m. high.

ANTIDESMA GIBBSIÆ, *Hutchinson*, sp. nov.

Arbor parva; ramuli subteretes, parce nigro-pubescentes. *Folia* oblonga vel oblongo-elliptica, basi rotundata, apice caudato-acuminata, acumine longe mucronato, 15–20 cm. longa, 5–8 cm. lata, integra, chartacea, utrinque nitida, glabra, nervis lateralibus utrinque 15–16 intra marginem arcuatis anastomosantibus supra paullo subtus valde prominentibus, tertiariis arcte reticulatis subtus prominulis; petioli 4–5 mm. longi, vix 2 mm. diametro, dense subappresse setulosi; stipulæ subulatæ vel subulato-lanceolatæ, 0·75–2 cm. longæ, usque ad 2 mm. latæ, setulosæ. *Spicæ* ♂ axillares, solitarii, eramosi, 8 cm. longi; rhachis tomentella; bracteæ ovato-lanceolatæ, acutæ. *Calyx* ultra medium divisus, 5-merus; segmenta ovato-rotundata, 1 mm. lata, extus pubescentia. *Discus* crassus, glaber vel margine leviter pubescens. *Stamina* plerumque 4 (rarius 3); filamenta 1 mm. longa, glabra; antherarum loculi distincti, globosi. *Ovarii rudimentum* subintegrum, parvum, breviter pilosum. *Spicæ* ♀ breviter pedunculatæ, 9–13 cm. longæ; rhachis pubescens. *Calyx* ad medium 5-lobatus, lobis triangularibus subacutis pubescentibus. *Discus* patelliformis, subinteger, crassus, extus parce pubescens. *Ovarium* oblique ellipsoideum, glabrum; styli 2, laterales, brevi, bilobi, acuti. *Fructus* subsessilis, 1 cm. longus, 5 mm. latus, ruber.

Hab. Tenom, secondary jungle, 700–1000′. ♂ & ♀. Jan. ♂. 2790. ♀. 2809.

Small tree; male spikes yellow; fruit bright red.

Apparently allied to *A. neurocarpum*, Miq., but easily distinguished by its larger and more closely veined leaves with a broader acumen, smaller and much narrower stipules, and sessile fruits.

ANTIDESMA GHESAEMBILLA, *Gaertn. Fruct.* i. 189, t. 39.

Kaningau plain, 1000′, a common little marsh tree. Jan. ♂. 2960. ♀. 2961.

Distrib. Borneo (D. Borneo). Common in Malay Archipelago, N. Australia, China and India.

ANTIDESMA NEUROCARPUM, *Miq. Fl. Ind. Bat. Suppl.* 466.
Hills round Tenom, 1300′, jungle-clad ridges. ♂. Jan. 2882.
Distrib. Borneo (Sarawak ; D. Borneo). Sumatra.
"Small tree, 10 m. high ; ♂ flowers white." Easily distinguished by the large foliaceous stipules.

MICRODESMIS CASEARIÆFOLIA, *Planch. in Hook. Ic. Pl.* sub t. 758.
Near Tenom, 700′, in marshy forest. ♂. Jan. 2658.
Distrib. Borneo (B. N. B. Kudat, *Fraser* ; D. Borneo). Malay Peninsula, Philippines ; Indo-China and Assam.
"Small tree or scrambler, with glossy dark green leaves and yellow flowers."

CLAOXYLON RUBESCENS, *Miq. Fl. Ind. Bat.* i. II. 387.
Kaningau plain, 1000′, in sec. jungle. ♂ ♀. Jan. 2956.
Distrib. Borneo (B. N. B. Kudat, *Fraser*, 78, seems to represent the same form). The species is spread throughout the Archipelago.
This plant seems to be the form of *C. rubescens*, Miq., distinguished by Müller in DC. Prodr. as var. *Meyerianum* ; but after examining the abundant material collected since Müller's time, his varieties seem to be scarcely tenable.

ACALYPHA CATURUS, *Blume, Bijdr.* 629.
Apin Apin, 1500′, common in sec. forest. ♀. Feb. 2987.
Distrib. Borneo (B. N. B. Kinabalu, Penokok, 3000′, *Haviland* ; Sarawak ; D. Borneo). Java and Sumatra.

ACALYPHA STIPULACEA, *Klotzsch in Nov. Act. Acad. Nat. Cur.* xix. Suppl. I. (1843) 416.
Mensangau, 2500′, common in open "Lalang" and sec. forest. ♀. Feb. 3036. Also seen from Apin Apin to Tambunan.
Distrib. Borneo (B. N. B. Banggi, *Fraser* ; Kinabalu, Tampussuk river, 2500′, *Haviland*). Philippines and Moluccas.

MALLOTUS MOLUCCANUS, *Müll.-Arg. in Linnæa*, xxxiv. (1865) 185.
Tenom, 700′, in sec. jungle. ♂ ♀. Jan. 2653. Melalap, 800′, in sec. jungle by river. ♂. 2721.
Distrib. Borneo (D. Borneo). Java, Timor, Dammar Island, Philippines, Formosa ; and collected in India and Ceylon.
"A common forest tree, 12 m. high, in old and recent clearings ; racemes yellowish green."

MALLOTUS RICINOIDES, *Müll.-Arg. in Linnæa*, xxxiv. (1865) 187.

Tenom, 700–1000′, general in sec. jungle throughout the country. ♂ ♀. Jan. 2660.

Distrib. Borneo (B. N. B. Port Myburgh, *Creagh*). Java, Philippines, Little Kei Island ; China.

"Forest tree, 20–26 m. high, ♂ and ♀ flowers green."

*MACARANGA HYPOLEUCA, *Müll.-Arg.*, var. BORNEENSIS, *Hutchinson*, var. nov. A typo foliis segmentis longioribus et angustioribus longe acuminatis, nervis tertiariis laxis, capsulis breviter stipitatis differt.

Between Koung and Kabayo, 1000′, in sec. jungle. Fr. Feb. 4295.

Distrib. Borneo (Sarawak ; without precise locality, *Low*). The type occurs in Sumatra, but Haviland collected on Matang, near Kuching in Sarawak, a specimen in leaf, which appears to be the same.

Var. *borneensis* may be a distinct species, but as no ♂ flowers are yet known, it seems undesirable to describe it.

MACARANGA TANARIUS, var. TOMENTOSA, *Müll.-Arg. in DC. Prod.* XV. II. 997.

Tenom, 700–1000′, in sec. jungle in old and recent clearings. ♂ ♀. Jan. 2652.

Distrib. Borneo (Sarawak ; D. Borneo). Common in the Malay Peninsula and Archipelago and in the islands off the south coast of China.

"A forest tree, 10–20 m., generally infected with ants."

SAPIUM SEBIFERUM, *Roxb. Fl. Ind.* iii. 693.

Tenom, 700–3000′, in sec. jungle and old and recent clearings throughout the country. Fl. Fr. Jan. 2659.

Distrib. Borneo (Sarawak). A native of China and cultivated in most warm countries.

MORACEÆ. (H. N. RIDLEY.)

TREMA AMBOINENSIS, *Blume, Mus. Lugd.-Bat.* ii. 61.

Jesselton, in young jungle, abundant. Fl. Fr. 2587.

Distrib. Borneo (Kudat, *Fraser* ; Sarawak). Malay Peninsula and Archipelago, Philippines and New Guinea, to Polynesia and N.E. Australia ; China, Indo-China to India.

FICUS MIQUELII, *King in Journ. R. As. Soc. Beng.* lv. No. 4 (1886) 405.

Melalap, on the banks of the Pengallan river, 800′, in sec. forest. Jan. 2759.

Distrib. A common tree all over the Malay region.

Ficus indica, *Linn. Sp. Pl.* ed. 2, 1514.

Usakan Bay, overhanging the sea on a sandstone spur. March. 4329.

Distrib. Common all over the Malay and Indian region.

"Tree, 13 m., receptacles yellow." The common Malay Peninsula form is not this, but the near var. *Gelderi.* This form appears common in the Archipelago.

Ficus gibbosa, *Blume*, var. typica, *King, Ficus Spec.* 5, pl. 2. i. 7.

General about Tenom and Melalap, 700–1000′, in sec. forest. Jan. 2841. Bridle-path to Melalap, 1000′. 2852.

Distrib. Common all over the Malayan region.

"A magnificent tree, 38 m., with drooping branches and the habit of 'Waringin' (*Ficus Benjamina*, Roxb.). Fruit yellow, mature reddish."

*Ficus Gibbsiæ, *Ridley*, sp. nov.

Arbor cortice sicco rufescente. *Folia* glabra, alterna, tenuiter coriacea, elliptica, longe acute-cuspidata, cuspide 1 cm. longo, basibus breviter angustatis, nervis subhorizontalibus paribus 10 nervo intramarginali connexis, cum reticulatione subtus prominulis superne inconspicuis. *Petioli* 1 cm. longi vel minores. *Sycidia* rubra, globosa, 5 mm. longa, in axillis geminata, pustulosa, maculis pallidioribus, pedicellis 2 mm. longis. *Bracteæ* ad pedicelli basin singulæ, lanceolatæ, acuminatæ, sub sycidio 2, ovatæ, acutæ, minimæ. *Sycidii ostium* rotundatum nec elevatum. *Flos* masculus breviter pedicellatus, pedicello capillis sericeis tecto. *Perianthii* lobi 3 oblongi, dense sericei. *Stamen* 1, perianthio brevius, filamento brevi; anthera majuscula, oblonga. *Perianthium* femineum simile ac majus, pedicello paullo longius. *Achænium* globoso-pyriforme, læve, pallide cervinum, stylo brevi laterali.

Hab. Kinabalu, high forest, Gurulau spur, 5000′. Feb. 4008. Kiau, 3000′, in recent sec. forest. Feb. 3972.

"Tree, receptacles red."

A rather striking plant on account of its narrow leaves (which dry a bright yellow, and the unusually silky hairy flowers. It seems nearest to *F. cuspidata*, Reinw. (section *Sycidium*).

Ficus chrysocarpa, *Reinw. ex Blume, Bijdr.* 475, var.

Renagong, 2000′, common all through the sec. jungle. Feb. 3940.

Distrib. Malaya.

"Tree, receptacles yellow."

This differs from the common Singapore form in its more glabrous leaves, which are also more polished above and have rounded bases. Miss Gibbs gives this as a tree and so does Wray on a ticket from a specimen collected at Tapak, in Perak, but a plant collected by Haviland at Pengkulu Ampat, in Sarawak, is quoted as a shrub. King gives it as 10 to 30 feet high. It

is an extremely common shrub about 4 feet tall in secondary jungle and borders of woods all over the Malay Peninsula, and very variable in leaf form, but I cannot say that I have ever seen it as anything bigger than can be called a big shrub, with comparatively few spreading branches. The commonest form is from 4 to 5 feet tall. The figs, of which few contain female flowers and ripen, are, when ripe, brilliant cherry-red. The younger ones are yellow.

CONOCEPHALUS NAUCLEIFLORUS, *Engl. in Engl. & Prantl, Nat. Pflanzenfam.* III. i. 94, f. 68 A–C (1889).

Tenom, 700–800′, a liane in sec. forest. ♂. Jan. 2722.

Distrib. Borneo (B. N. B. Kinabatangan, *Creagh*). Malay Peninsula, Java, Sumatra, and Philippines; Indo-China to Eastern Himalayas.

"An immense liane, spreading like a tree when it reaches the apex of its support."

URTICACEÆ.

LAPORTEA STIMULANS, *Miq. in Zoll. Cat.* 103.

Kinabalu, 4000′, Kadamaian river, in high forest. ♂. Feb. 4104.

Distrib. Borneo (B. N. B. Kinabalu, 5000′, *Haviland*; D. Borneo). Java.

Tree, with white flowers.

PILEA JOHNIANA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 227, pl. xix. D. 17–26.

Kinabalu, 12,000–13,000′, on the granite core, in cracks and where moisture accumulates. Fl. Fr. 4197.

Distrib. Borneo (B. N. B. Kinabalu, 11,000–12,000′, *Haviland*).

A prostrate plant, forming a green mat.

PILEA STAPFIANA, *Gibbs*, comb. nov. Syn. *P. crassifolia*, Stapf in Trans. Linn. Soc. ser. 2. Bot. iv. (1894) 228 (*non* Hance).

Kinabalu, Penibukan ridge, 5000′, between Dahobang and Kinitaki rivers, undergrowth in high forest. Fl. Feb. 4055.

Distrib. Borneo (B. N. B. Kinabalu, 3000′, *Haviland*).

An erect, herbaceous plant, with pink flowers, 0·75 m. in height.

When writing his memoir, Hance's previously published *P. crassifolia* was obviously overlooked by Dr. Stapf.

*PELLIONIA KABAYENSIS, *Gibbs*, sp. nov.

Herba ascendens. *Caulis* simplex, pluri-sulcatus, pilosulus. *Folia* opposita, dimorpha, heteropleura, paris cuiusque alterum minutum sessile, squamiforme,

deflexum, semiorbiculari-cordatum, caducum, paucidentatum, alterum grande, petiolatum, obovatum, basi oblique cuneatum, apice in acumen longum acutum integrum sensim angustatum, crenato-serratum, triplinerve, nervis lateralibus in latere majore 2–3, superne sub-lente cystolithis linearibus obtectum, inferne cystolithis nervis parallelis.

Hab. Between Bundu Tuhan and Kiau, 3000′, in sec. forest undergrowth. ♂ (pink). Feb. 3945. Kabayo, undergrowth in sec. forest. ♂ (white). Feb. 4296.

The leaves in this plant have dried a greenish-brown colour, about the same on both surfaces; the petioles are 1–2 cm. long and the largest leaf is 2 dm. in length (excluding the acumen, which is broken off), and 5 cm. across; the next largest is 1·6 dm. long (including acumen 2 cm. in length), and 8 cm. broad; the stipules are lanceolate acute, with dilated bases, membranous, ±2 cm. long. The ♂ cymes are axillary, solitary or binate, long-pedunculate, with a setose rhachis, the whole inflorescence varying very much in length, from 2–8–12 cm. long, when well developed. The ♂ flowers are 5-partite and 5-staminate, 3 mm. across, shortly pedicellate, the perianth-lobes round and membranous, with brown veinings.

This species is nearest to *P. Griffithiana*, Wedd. (ex descr.), but differs in the long-petiolate and larger leaves, larger stipules, and the long-peduncled ♂ inflorescence.

ELATOSTEMA BULBOTHRIX, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 230, pl. 19 A. 1–4.

Kinabalu, between Kamburangau and Pakapaka, 9000′, on the open serpentine ridge, in undergrowth. Fl. Feb. 4282.

Distrib. Borneo (B. N. B. Kinabalu, 10,000′, *Haviland*).

*ELATOSTEMA GURULAUENSIS, *Gibbs*, sp. nov.

Herba erecta. *Caulis* teres, piliusculus, fuscescens. *Folia* alterna, petiolata, suboblique ovato-lanceolata, basi sensim inæqualiter attenuata, apice caudato-acuminata, a medio grosse dentata, tenuiter membranacea, supra glabra, nigricantia, subtus sparse pilosa et fuscescentia, triplinervia; nervi laterales 3–5, ut nervus medius dense pilosiusculi, cystolithis nullis.

Hab. Kinabalu, Gurulau spur, 5000′, in high forest undergrowth. Fl. Feb. 4013. Below Pakapaka cave, 9000′, in sheltered scrubby forest undergrowth. 4283.

The plant shows a creeping rhizome, with single unbranched aerial shoots, 2·5 dm. (no. 4013) to 1 dm. high (no. 4283). The shoots of the latter specimen are altogether smaller and more delicate in texture. The stipules are lanceolate, membranous, glabrous, 6 mm. long and 2 mm. broad. The ♂ cymes are axillary, shortly pedunculate, 6 mm. broad and 3 mm. in height, the involucre consisting of three bracts, two large ones with

acuminate apices, and four narrow lateral ones, rounded at the apex, all pilose on the outer surface, with membranous ciliate wings. No ♂ flowers were found. The ♀ cymes are about the same size or somewhat smaller, with an involucre of two larger opposite bracts, and many narrow ligulate ciliate ones. The ♀ flower is pedicellate, and characterised by an unusually well-developed 4-partite perianth, with lobes 2–4 mm. long, which is succeeded by four inflexed staminodes. In the sterile flowers the perianth shows even greater development. The achene is brown, 2 mm. long.

This species is nearest to *E. Lowii*, Stapf, collected at 5000′ on Kinabalu by Low. It differs in the unbranched habit, in the very hairy stems, the petiolate and less oblique leaves with cuneate bases, and the veins which are on the under surface being densely clothed with hairs.

*ELATOSTEMA PEDICELLATUM, *Gibbs*, sp. nov.

Herba erecta; caulis in sicco strigillosus, inferne adpresso-hirtellus. *Folia* petiolata, alterna, disticha, oblique obovata, basi inæqualiter cuneata, apice acuta, a medio crenato-dentata, glabra, supra cystolithis obtecta, triplinervia, 3–4-costulata, nervis subtus facile visis cystolithis nervis parallelis sub lente optime manifestis ornatis.

Hab. Kinabalu, Penibukan spur, 6000′, in mossy forest undergrowth. ♂ ♀. Feb. 4057.

In this plant the creeping rhizome sends up single aerial shoots, or 2–3 from one node. The shoots are dorsiventral, and recurved at the apex, 1·5–2·8 dm. in height and leafy for about $\frac{1}{3}$ to $\frac{1}{2}$ up the stem, where they are 0·7 dm. broad. The stipules are lanceolate, membranous, yellow-green in colour, 6 mm. long and 2 mm. broad. The leaves are olive-green in the dried condition, the petiole being 2 mm. long, while the largest leaf is 3 cm. long and 1·6 cm. across. The ♂ cymes are shortly pedunculate, solitary and axillary, 7 mm. in length, with the involucre composed of 6 bracts, the two largest on the outside with the four smaller at right angles to them, all hairy on the outside; the ♂ flowers are few in number, and characterised by the length of the pedicel, which is 6 mm. long, the perianth is 4-partite, 3 mm. long and 2 mm. across, each lobe terminated by a tuft of cilia. The ♀ cymes are sessile in the axils of the lower leaves, round in outline and 6 mm. across, with involucres consisting of two larger bracts and a number of narrow ciliate smaller ones. The ♀ flower is pedicellate and shows a gland-ciliate perianth of four minute segments, succeeded by incurved staminodes; the ovary is 1 mm. long. A sterile flower showed three perianth-segments and three incurved staminodes.

This plant is nearest to the Philippine *E. obovatum*, Wedd., from which it differs in the erect habit, and petiolate acuminate leaves, cuneate at the base. The ♂ flowers are not known for *E. obovatum*, but in the present species they differ from most members of the genus in the very long pedicels.

ELATOSTEMA THALICTROIDES, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 229, pl. 19 B. 5–8.

Kinabalu, slopes above Lobang, 6000′, in high forest. Fl. Feb. 4135.

Distrib. Borneo (B. N. B. Kinabalu, 5000′, *Haviland*).

A graceful plant, 0·30–1 m. in height, abundant in the herbaceous undergrowth of the primary high forest from 4000–6000′.

*ELATOSTEMA VIRIDISSIMUM, *Gibbs*, sp. nov.

Herba erecta, tota hirsutissima. *Caulis* in sicco strigosus. *Folia* alterna, disticha, sessilia, oblique oblongo-oblanceolata, falcata, basi in latere exteriore auriculatim producta, in interiore attenuata, apice acuminata, firma, in sicco viridissima, dentata, supra cystolithis densissime inspersa, triplinervia, nervis lateralibus in latere majore 6–7, supra valde impressis, subtus maxime prominentibus albido-pilosis cystolithis obtectis.

Hab. Kinabalu, Penibukan spur, 6000′, in mossy forest undergrowth. ♀. Feb. 4054.

The aerial shoots are from 1–2·6 dm. in height, the leafy portion being half the length of the stem (which is branched in the specimen figured) and 1–7 dm. broad. The stipules are lanceolate, yellow-green, 6 mm. long and 2 mm. broad, hirsute and dotted with cystoliths on the upper surface. The largest leaves are 6 cm. long and 2·2 cm. broad; the tertiary veins form marked areoles on the upper surface of the leaves, the veins being depressed and glabrous.

The cymes are sessile, 1–1·3 cm. long and 7 cm. broad, the involucres consisting of two large connate bracts, 4 mm. long and 2 mm. broad, with reflexed apices, and four smaller ones, all densely hirsute, with scattered cystoliths on the outside, but smooth and glabrous on the inside. In the cymes in the axils of the upper leaves no flowers were found, only hirsute and persistent bracteoles; those in the axils of the lower cymes were ♀, the pedicels of the flowers being 2 mm. long; no perianth was seen, but five staminodes, not inflexed, occurred below the ovary; on one sterile flower, however, only two staminodes were found. The achenes were 1 mm. long, brown and smooth in texture.

In the extraordinary hairiness of the whole plant, the bright green colour of the leaves and their peculiar reticular areolation, this species differs from any *Elatostema* so far seen.

*ELATOSTEMA KINABALUENSE, *Gibbs*, sp. nov.

Herba erecta, minima, omnimodo pilosiuscula. *Caulis* sulcatus, in sicco nigrescens, ramis gracilibus. *Folia* alterna, sessilia, oblique oblanceolata vel obovata, basi plerumque latere altero acuta vel subacuta, altero rotundata vel subauriculata, apice acuta, margine a medio vel fere a basi acute serrata, chartacea, supra nigro-virescentia, subtus pallidiora, pustulata, triplinervia,

nervis lateralibus utrinque 2–3, supra impressis, subtus prominentibus, cystolithis utrinque nullis.

Hab. Kinabalu, Penibukan spur, 6000′, in high forest undergrowth. ♂ ♀. Feb. 4063.

This plant shows a creeping rhizome, with very short internodes from which several aerial shoots arise at the same level. These shoots may be single or branched, and are 11–14 cm. in height, and leafy for 5–6 cm. up the stem. The stipules are ligulate acuminate, 2 mm. long and 0·5 mm. across, membranous-glabrous, brown. The largest leaves are 2 cm. long and 0·7 cm. broad; the leaves are peculiar in showing a pustulate upper surface, caused by the bases of setose white hairs which occur in areas formed by the tertiary veins; these bases are convex on the upper surface of the leaves and concave on the lower; the brittle hairs may break off, but the bases persist. The peduncle of the ♂ cyme seen is 6 mm. long, the latter measuring 5 mm. across; there are six bracts to the involucre, two large and four smaller and narrower; the perianth of the ♂ flower is 4-partite, each lobe showing a conical apical projection, with hairs; four introrse stamens are seen in the immature flowers. The ♀ cymes are round and 3 m. across, the involucre is composed of bracts all more or less the same size, narrow ligulate and ciliate; the ♀ flowers are pedicellate, with a minute 4-partite and gland-ciliate perianth, and three staminodes, as far as could be determined; the achene is under 1 m. in length. Sterile flowers show the usual increase in size in the staminodes.

This plant, in its diminutive size and in the shape and colour of the leaves, is nearest *E. palawanense*, Roxb., from Mt. Victoria, at about 3500′, but it differs in the peculiar pustulate appearance of the upper surface of the leaves, caused by the bases of setose white hairs.

Elatostema rubro-stipulatum, *Gibbs*, sp. nov.

Herba erecta. *Caulis* superne patule hirsutus, inferne glabratus, nigrescens. *Folia* alterna, subpetiolata, oblique falcato-oblonga, oblique auriculata, acuminata, fere a medio argute dentata, supra viridia, sparse adpresse setulosa, subtus fuscescentia, in costa nervisque setoso-hirsuta, heteropleura, triplinervia.

Hab. Kinabalu, 4000–6000′, in high forest undergrowth to above Lobang. ♂ ♀. Feb. 4134.

The aerial shoots of this species arise singly and unbranched from the creeping rhizome, and are 14 cm. long; the upper part is recurved and leafy for about 7–9 cm. The stipules are most characteristic, being red in colour, membranous and very persistent, two to each leaf all down the stem; they are obovate acute, 12 mm. long and 5 mm. broad. The ♂ cymes are long-pedunculate, with the peduncle sparsely pilose, 4 cm. long; the cymes are

8 mm. broad and 5 mm. high ; the involucre consists of six bracts, the two largest being very lengthily acuminate, while the four smaller have also a well-developed acumen; the perianth of the ♂ flower is 4-partite, 3 mm. across, one segment showing a conical projection at the apex ; there are four stamens. The ♀ cymes are sessile, 5 mm. broad and 2·5–3 mm. high, with an involucre of six bracts, two larger and four smaller, all with serrate margins ; the ♀ flower is petiolate, with a minute gland, ciliate 4-partite perianth and four inflexed staminodes, surmounted by the ovary, with the achene 1 m. long.

This plant is nearest to *E. lithoneuron*, Stapf, collected by Haviland on Kinabalu at 11,000′, but differs in the subpetiolate shorter and broader leaves, the conspicuous red stipules and the ♂ and ♀ inflorescences.

*ELATOSTEMA TENUMPOKENSIS, *Gibbs*, sp. nov.

Herba erecta. *Caulis* superne foliosus, pubescens, cito glabrescens, ramis gracilibus. *Folia* alterna, sessilia vel subsessilia, oblique falcato-oblanceolata, basi in latere exteriore auriculatim producta, in latere interiore plerumque obtusa, attenuata, apice acuminata, tenuiter membranacea, pilis sparsis obtecta, in sicco viridula, subtus griseo-virescentia, triplinervia, nervis lateralibus 4–5, subtus cystolithis linearibus crebris secus nervos distributis ornata.

Hab. Kinabalu, Tenumpok ridge, 4000′, in high forest undergrowth. ♂ ♀. Feb. 3947.

This plant shows a woody rootstock, almost radial in appearance, from which in one specimen five branched aerial shoots arise, the largest being 3 dm. in height, the leaves only occurring towards the apex of the branches. The largest leaves are 5 cm. in length and 1·8 cm. in breadth, with veins conspicuous on both surfaces but more so on the lower. The stipules are persistent, ligulate in shape, 7 mm. long and 1·5 mm. broad, of membranous texture, brownish in colour and flecked with darker brown spots. The ♂ cymes are pedunculate, with the peduncle 5 mm. long, the cymes 6 mm. broad and 4 mm. high ; there are six bracts to the involucre, two large and four smaller. The ♂ flowers are only in bud, but the perianth shows four lobes, produced at the apex, and four stamens, the whole structure being pilose. The ♀ cymes are sessile, ±5 mm. across and 2·5 mm. high, surrounded by an involucre of numerous uniform keeled and ciliate bracts. The pedicillate flowers show a minute 4-partite gland, a ciliate perianth, four inflexed staminodes and an ovary. The achene is 1 mm. long. A sterile flower showed three perianth-segments and three staminodes.

I can name no affinity for this plant, which is peculiar in its quasi radial rootstock, branching habit, persistent stipules and membranous green eaves

*ELATOSTEMA PENIBUKANENSIS, *Gibbs*, sp. nov.

Herba erecta, tota glaberrima. *Caulis* tenuis, striatus, glaber. *Folia* alterna, petiolata, oblique lanceolata, basi obliqua in latere exteriore subauriculata, in latere interiore acuta, apice tenuiter acuminata, crenata, membranacea, supra viridia, subtus pallidiora, cystolithis sub parenchymate absconditis difficillime aspectabilibus, supra prominenter, triplinervia, nervis lateralibus utrinque 2–3 tenuibus, nervis tertiariis subtus patulis, reticulatione rufescente.

Hab. Kinabalu, Penibukan spur, 5000′, where it dips to the Kinitaki river. ♂. Feb. 4064. Above Lobang, 6000′, in high forest undergrowth. ♂. 4120.

This very delicate plant shows a creeping rhizome, which sends up aerial shoots, about 7 cm. apart, with yellow stems, the same colour as the rhizome. The shoots are more or less radial in habit, the stems being clothed with leaves for more than half their length. The stipules are colourless, very thin and membranous, 1·1–3 cm. long and 2 mm. broad. The largest leaves are 4·5 mm. in length and 1·5 cm. broad, with petioles 2–5 mm. long; scattered cystoliths occur on the upper surface of the leaves, but are only visible under a compound microscope. The attenuated peduncles of the ♂ cymes vary from 1·5 cm. to 3·5 cm. in length, bearing cymes ±8 mm. broad and 4 mm. high; the receptacle is flat and enclosed in six bracts, two larger and four smaller and narrower; the perianth of the ♂ flowers is 5-partite, 2 mm. in length.

This species is in radial habit and general appearance very near *E. luzonense*, C. B. Rob., well distributed in the island of Luzon, but differs in the total glabrousness of the whole plant, in the darker petiolate leaves with rounded crenate margins, in the fewer veins and conspicuous finer reticulations of the tertiary veins, also in the absence of cystoliths visible to the naked eye.

Robinson, in treating of the Philippine Elatostemas (Phil. J. of Sci., Bot. v. (1910) 499, describes the flowers of *Elatostema* as pedicellate "with a cup-shaped perianth, with very short round lobes, sometimes ciliate, but this last is a most inconstant character." He goes on to say, "apparently these are treated by Stapf (**17.** 231) as staminodes, but this interpretation would involve the presence of staminodes at the base of an ovary raised upon a common peduncle, which is quite distinct from anything else in the family."

In an unpublished figure of *E. Lowii*, on the type-specimen sheet in the Kew Herbarium, Dr. Stapf has shown a gland-ciliate perianth with pointed lobes, and the infolded staminodes with rounded lobes above it. It is therefore difficult to see what other interpretation could be placed on the latter structures, when they are found to occur without the perianth, as is the case in *E. bulbothrix*, Stapf.

A similar structure in the Fijian *E. fruticosum* led me into the same error of describing the staminodes as a perianth (Journ. Linn. Soc., Bot. xxxix. (1909) 172).

In the present instance staminodes were invariably present, but were not seen "cup-shaped." In one species (*E. viridissimum*) five distinct lobes were seen, in the other species the lobes were longer and infolded, expanding on the shedding of the fruit. They varied from 3–5 in number, but though exceptions may occur on the same plant, four is the usual number. The lobes of the "perianth," as described by Robinson and myself, were invariably seen entire and not ciliate. The real perianth, however, as understood by Stapf, was found in every species examined, with the exception of *E. viridissimum*, but it is sometimes so minute as to be only visible under the compound microscope. It is composed of 3–4 pointed segments, minutely gland-ciliate, with the exception of *E. gurulauensis*, where it was best developed, and simply ciliate with long cilia.

With regard to the staminate receptacles, I can confirm Robinson's experience with the Philippine species classified by him, viz.: "the presence of an outer pair of opposed bracts, each having at each margin and interior to them, another bract, in addition to these six outer bracts there may be, and in the majority of cases are, others." In the ♀ cymes the structure was not so definite. The two opposing bracts were present, but might be only very slightly differentiated, and much narrower ones would surround the receptacle.

I have also found that the ♂ peduncles vary in length, that the outer bracts of the receptacle are generally corniculate, that the staminate develop successively, and that ♂ and ♀ receptacles may be present on one shoot, while another will bear only ♂, and in some cases only ♀. I have also found both kinds of flower in one receptacle as Robinson states, and can confirm the inconstancy of the other characters mentioned by him.

With regard to the sterile flowers, as described and figured by Weddell (Mon. des Urticées, pl. 9 D. figs. 10 & 14), and not mentioned by Robinson, these were sometimes so numerous as to be visible to the naked eye, in other cases perhaps only one would be found in a receptacle. These flowers are, as Weddell describes them, "flowers in which the ovary has fallen or has not developed."

POUZOLZIA INDICA, *Gaud. in Freyc. Voy. Bot.* 503.

Tenom, 700′, a weed in clearings. Fl. Jan. 2638.

Distrib. Borneo (B. N. B. Kudat, *Fraser*: Labuan, *Motley*; Sarawak; D. Borneo). Java, Buru and Sunda Islands, Philippines and New Guinea; China, India and Ceylon.

POUZOLZIA VIMINEA, *Wedd. in DC. Prod.* xvi. I. 228.

Mensangau, 3000′, in "Lalang" clearings. Feb. ♂. 3033, ♀. 3034.

Distrib. Malay Peninsula, Java ; China and Japan ; Indo-China to India.

PIPTURUS ARGENTEUS, *Wedd. in DC. Prod.* xvi. I. 235[19].

Apin Apin, 1500′, a small tree in sec. forest. Fl. Feb. 2982.

Distrib. Borneo (Sarawak). Java, Timor, Timor Laut, Amboina, and Aru Islands ; New Guinea to N.E. Australia and Polynesia.

AMENTACEÆ.

QUERCUS HAVILANDII, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 231, pl. 18 A. 1–4.

Kinabalu, 9500′, in sheltered low forest below Pakapaka. ♂. Feb. 4264.

Distrib. Borneo (B. N. B. Kinabalu, 9000–10,500′, *Haviland*).

A small compact tree, 2 m. in height.

ORCHIDACEÆ. (R. A. ROLFE.)

The Orchids collected by Miss Gibbs number 48 species, of which twenty are new, including one new genus. In working them up two others collected on Mt. Kinabalu by Haviland were found, and as these had been named by Dr. Kränzlin but not described they are included in the present paper, which thus deals with fifty species, of which 22 are here described for the first time. There is also one in fruit only, which may or may not be distinct. Of the fifty species 42 were collected on Mt. Kinabalu; of these no fewer than 23 are not yet known from elsewhere, and five others are only known from Borneo.

It may be interesting to compare the recent collection with that made by Dr. Haviland eighteen years earlier. Ridley enumerated 24 species as collected by Dr. Haviland, of which 18 (or a proportion of 75 per cent.) were endemic. To these must be added two species not enumerated by Ridley, making a total of 26, of which 20 were endemic. Miss Gibbs has only re-collected seven of these, but on the other hand she has made 35 additions (this only includes those actually collected on Mt. Kinabalu itself), so that if the two collections are added together we get an aggregate of 61 species found on the mountain, of which 53 (or a proportion of about 80 per cent.) are not known from elsewhere.

*MICROSTYLIS KINABALUENSIS, *Rolfe,* sp. nov.

Rhizoma repens. *Folia* petiolata; limbus ovatus, acutus, submembranaceus, 2–4 cm. longus, 1–2 cm. latus, multinervis ; petiolus 1–2 cm. longus, basi

ample vaginatus. *Scapi* 7–12 cm. longi ; racemi angusti, 4–7 cm. longi, multiflori. *Bracteæ* ovato-lanceolatæ, acutæ, concavæ, 2–3·5 cm. longæ. *Pedicelli* 3–4 cm. longi. *Flores* parvi. *Sepala* patentia, 2·5–3 cm. longa, posticum late ovatum, subobtusum, lateralia suborbicularia vel orbiculari-elliptica, obtusa. *Petala* elliptica vel elliptico-oblonga, obtusa, 2·5–3 cm. longa. *Labellum* 3·5 cm. latum, basi profunde sagittato-cordatum, apice breviter trilobum ; lobi laterales lati, subtruncati vel subdenticulati ; lobus intermedius transverse oblongus, obtusissimus vel emarginatus ; discus leviter tricarinatus. *Columna* 1 mm. longa, alis oblongis. *Capsula* obovato-oblonga, 9 mm. longa.

Hab. Kinabalu, Penibukan ridge, 6000′, between Dahobang and Kinitaki rivers, in mossy forest. Feb. 4065. Flowers orange.

Closely resembling the Celebes *M. cordifolia*, Rolfe, in habit, but the leaves are rather longer and less caudate, and the petals and front lobe of the lip much shorter and broader.

*LIPARIS DISTICHA, *Lindl. Bot. Reg.* sub t. 882.

Kinabalu, Gurulau, 5000′, above Kiau ridge in primary forest. Feb. 4014. Epiphytic. Flowers reddish.

Distrib. Borneo (Sarawak). Malay Archipelago and Peninsula, Burma and Ceylon, Philippines, Polynesia, Mascarene Islands.

DENDROCHILUM STACHYODES, *J. J. Sm. in Rec. Trav. Neerl. Ind.* i. 77.

Kinabalu, 12,000′, cracks in granite at the base of the granite core. Feb. 4181. Flowers cream-colour, abundant.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*).

DENDROCHILUM GRANDIFLORUM, *J. J. Sm. in Rec. Trav. Neerl. Ind.* i. 66.

Kinabalu ; general up to Pakapaka, 9000–10,000′, in mossy forest. Feb. 4250. Epiphytic. Flowers brownish-green.

Distrib. Borneo (B. N. B. Kinabalu, 10,500′, *Haviland*).

*DENDROCHILUM (§Acoridium) GIBBSIÆ, *Rolfe*, sp. nov.

Pseudobulbi approximati, ovoideo-oblongi, circiter 2 cm. longi, monophylli. *Folia* lineari-lanceolata, subobtusa, 10–20 cm. longa, 1·2–1·8 cm. lata. *Scapi* graciles, suberecti vel arcuati, 20–25 cm. longi ; racemi 10–15 cm. longi, multiflori. *Bracteæ* patentes, oblongo-lanceolatæ, subacutæ, concavæ, 2·5–3 mm. longæ. *Pedicelli* 2–2·5 mm. longi. *Flores* parvi. *Sepala* patentia, ovato-oblonga, apiculata, 3–3·5 mm. longa. *Petala* elliptico-oblonga, subobtusa vel apiculata, 3–3·5 mm. longa. *Labellum* latissime dilatatum, trilobum, 2·5 mm. longum, 4 mm. latum ; lobi laterales falcato-oblongi, subobtusi, ampli ; lobus intermedius subulatus, acutus, incurvus, minutus ; discus

prominenter bicarinatus. *Columna* 1·5 mm. longa ; stelidia e basi falcato-linearia, subobtusa, incurva, 1·5 mm. longa.

Hab. Kinabalu, Maraiparai spur, 7000′, in mossy forest. Feb. 4087. Epiphyte. Flowers reddish cream, with a large brown blotch on the lip.

Near the Philippine *D. recurvum*, Ames, but readily distinguished by the broader, falcate-oblong side lobes of the lip and the very minute front lobe.

*DENDROCHILUM (§Acoridium) KINABALUENSE, *Rolfe*, sp. nov.

Pseudobulbi anguste oblongi, circiter 2·5 cm. longi, monophylli. *Folia* lineari-lanceolata, subacuta, 10–15 cm. longa, 7–9 mm. lata. *Scapi* graciles, suberecti vel arcuati, circiter 25 cm. longi ; racemi 10–12 cm. longi, angusti, multiflori. *Bracteæ* patentes, oblongo-lanceolatæ, acutæ, subconcavæ, 2 mm. longæ. *Pedicelli* 2 mm. longi. *Flores* parvi. *Sepala* patentia, oblonga, acuta, 3 mm. longa. *Petala* oblonga vel lanceolato-oblonga, 3 cm. longa. *Labellum* late trilobum, 2·5 mm. longum, 3 mm. latum ; lobi laterales falcato-oblongi, obtusi, ampli ; lobus intermedius subulatus, acutus, minutus ; discus bicarinatus. *Columna* 1·5 mm. longa ; stelidia e basi falcato-linearia, subobtusa, incurva, 1·5 mm. longa.

Hab. Kinabalu, Maraiparai spur, 7000′, in mossy forest. Feb. 4085. Flowers yellow, with a small brown blotch on the lip.

Closely allied to the preceding, but differing in having narrower leaves and racemes, in the narrower more acute sepals and petals, and in the narrower lip with a much smaller brown blotch.

DENDROBIUM VILLOSULUM, *Wall. Cat.* 2006.

Kinabalu, Gurulau spur, 5500′, above Kiau ridge, on rotting logs. Feb. 4012.

Distrib. Borneo (B. N. B. Kinabalu, 3500′, *Haviland, Creagh* ; D. Borneo). Malay Peninsula.

*BULBOPHYLLUM KINABALUENSE, *Rolfe*, sp. nov.

Herba epiphytica. *Rhizoma* repens, radicans, epseudobulbosum. *Folia* circiter 6 cm. distantia, petiolata ; limbus elliptico-oblongus, obtusus, coriaceus, 4–5 cm. longus, 1·6–2 cm. latus ; petiolus 1·5–1·8 cm. longus. *Scapi* erecti, 10–14 cm. longi, basi vaginis spathaceis obtecti ; racemi 4–8 cm. longi, laxiflori. *Bracteæ* oblongo-lanceolatæ, subacuminatæ, 3–4 mm. longæ. *Pedicelli* 2–3 cm. longi. *Flores* parvi. *Sepalum* posticum lanceolato-oblongum, acutum, cucullato-concavum, 6 mm. longum ; sepala lateralia triangularia, subfalcata, 6 mm. longa ; mentum obtusum, 2 mm. longum. *Petala* oblonga, subobtusa, 3 mm. longa. *Labellum* recurvum, oblongum, subobtusum, subcarnosum, trinervium, 3·5 mm. longum, marginibus infra medium suberectis. *Columna* lata, 1 mm. longa, dentibus subulatis.

Hab. Kinabalu, above Lobang to Pakapaka, in mossy forest, 6000–9500′. Feb. 4252. Epiphyte. Flowers yellow.

Near *B. coriaceum*, Ridl., from the same locality, but the racemes more slender and the flowers much smaller and with much narrower segments.

*BULBOPHYLLUM GIBBSIÆ, *Rolfe*, sp. nov.

Herba epiphytica. *Rhizoma* repens, radicans, epseudobulbosum. *Folia* subapproximata, graciliter petiolata; limbus linearis vel oblongo-linearis, subobtusus, chartaceus, 6–9 cm. longus, 4–6 mm. latus; petiolus 2·5–3·5 cm. longus. *Scapi* erecti, gracillimi, 9–10 cm. longi, basi vaginis spathaceis vel tubulosis obtecti; racemi 5–6 cm. longi, laxiflori. *Bracteæ* oblongo-lanceolatæ, subacutæ, 1·5–3 mm. longæ. *Pedicelli* 1·5–2 mm. longi. *Flores* minuti. *Sepala* subconniventia, 4 mm. longa, posticum oblongo-lanceolatum, acutum, concavum, lateralia triangularia, subfalcata, acuta, concava; mentum obtusum, 1 mm. longum. *Petala* oblonga, subobtusa, 2 mm. longa. *Labellum* recurvum, elliptico-oblongum, obtusum, 2·5 mm. longum, obtuse bicarinatum, marginibus infra medium suberectis. *Columna* lata, 0·5 mm. longa, dentibus subulatis.

Hab. Kinabalu, Penibukan ridge, 6000′, in mossy forest. Feb. 4059. Also on the Maraiparai spur. Epiphyte. Flowers white.

Very distinct among the Malayan ebulbose species by the numerous narrow leaves and very slender petioles.

*ERIA (§Eriura) CYMBIDIFOLIA, *Ridl. in Journ. Bot.* xxxvi. (1898) 212.

Kinabalu, Gurulau, 5000′, undergrowth in high forest. Feb. 4009. Flowers pinkish.

Distrib. Borneo (D. Borneo).

Identified from description and from the analysis of a single flower (Kränzl. in Engl. Pflanzenr., Orch.-Dendrob. ii. 122, fig. 23 D–E).

ERIA (§Eriura) GRANDIS, *Ridl. in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 237.

Kinabalu, above and below Pakapaka cave, 9500–10,500′, in sheltered low forest. Feb. 4268. Predominating as undergrowth above the cave.

Distrib. Borneo (Kinabalu, 10,000–12,000′, *Haviland*).

Kränzlin (Kränzl. in Engl. Pflanzenr., Orch.-Dendrob. ii. 37) refers this plant to the section *Aëridostachyæ*, where it is quite out of place. Ridley does not give the section, but it seems to me to be an anomalous *Eriura*, having the same habit, though the flowers are larger and the lip very deeply saccate. The lip somewhat resembles that of *E. cymbidifolia*, Ridl. in outline, but is remarkable for the much thickened margins of the front

lobe, which cross the side lobes as a transverse keel and then descend to the base of the lip.

*Eria (§Eriura) villosissima, *Rolfe*, sp. nov.

Herba terrestris, 1 m. alta. *Caules* cylindrici, foliosi. *Folia* elongato-linearia, acuta, arcuata, 20–30 cm. longa, 1–1·8 cm. lata, coriacea. *Scapi* terminales, fasciculati, circiter 10, brunneo-villosissimi, circiter 20 cm. longi; racemi densiflori. *Bracteæ* lanceolatæ, acuminatæ, circiter 4 mm. longæ. *Pedicelli* 8 mm. longi, brunneo-villosissimi. *Flores* parvi, brunneo-villosissimi. *Sepalum* posticum ovato-oblongum, subobtusum, concavum, 4 mm. longum; sepala lateralia late triangulari-ovata, subobtusa, 4·5 mm. longa, 3 mm. lata; mentum saccatum, 2 mm. longum. *Petala* spathulato-elliptica, subobtusa, membranacea, 4 mm. longa. *Labellum* trilobum, breviter unguiculatum, 5 mm. longum, 3·5 mm. latum; lobi laterales oblongi, apice bilobi; lobus intermedius ovatus, subobtusus, apice callo magno erecto verrucoso instructus; discus leviter tricarinatus, basi callo oblongo erecto vel subrecurvo instructus. *Columna* lata, 1·5 mm. longa.

Hab. Kinabalu, Maraiparai spur, 7000′, in mossy forest. Feb. 4090. Flowers brown, with a cream-coloured and spotted lip.

Closely resembles *Eria major*, Ridl. (in Trans. Linn. Soc. ser. 2. Bot. iv. 237, in syn.) in general appearance and in the very villous inflorescence and flowers, but differs in its narrower leaves, shorter scapes and pedicels, narrower bracts, broader more spathulate petals, and in the different details of the lip.

The Malay Peninsula *Eria major*, Ridl. (*E. Kingii*, Hook. f. Fl. Brit. Ind. v. 790; Ic. Plant. t. 2066, not of F. Muell.) is very different from the original Bornean plant in the much shorter leaves, fewer scapes, which are white-pubescent, as well as the pedicels and the smaller flowers, and in its quite distinct lip. It may be called *E. Ridleyi*, Rolfe.

*Eria (§Aëridostachyæ) borneensis, *Rolfe*, sp. nov.

Herba terrestris, erecta, 45–60 cm. alta. *Pseudobulbi* ovoideo-oblongi, circiter 12 cm. longi, apice diphylli, basi vaginis conduplicatis imbricatis supremis foliaceis obtecti. *Folia* lanceolato-elongata, acuta, basi longe attenuata, coriacea, circiter 45 cm. longa, 3–4 cm. lata. *Scapi* axillares, circiter 45 cm. longi; racemi elongati, densiflori, 25–30 cm. longi; rhachis dense fusco-velutini. *Bracteæ* late ovatæ, 1·5 mm. longæ. *Pedicelli* dense fusco-velutini, 1·5 cm. longi. *Flores* parvi, dense fusco-velutini. *Sepalum* posticum ovato-oblongum, obtusum, incurvo-concavum, trinervium, 3·5 mm. longum; sepala lateralia late ovato-triangularia, obtusa, 3 mm. longa; mentum oblongum, obtusum, 4 mm. longum. *Petala* falcato-oblonga, obtusa, 3–3·5 mm. longa. *Labellum* integrum, elliptico-oblongum, obtusum,

crenulatum, 5 mm. longum; discus quinquenervis. *Columna* lata, 1·5 cm. longa.

Hab. Kinabalu, Kiau, 3000′, undergrowth in sec. forest. Feb. 3955. Flowers brown.

Allied to *E. aëridostachya,* Reichb. f., but the lip much more crenulate and apiculate, and the leaves and inflorescence much longer.

*Eria (§ Aëridostachyæ) kinabulensis, *Rolfe*, sp. nov.

Herba epiphytica. *Caules* cylindracei, incrassati, 10–11 cm. longi, basi vaginis conduplicatis obtecti, apice 2–3-phylli. *Folia* lanceolato-oblonga, subacuta, coriacea, 20–25 cm. longa, 1·5–3 cm. lata, basi attenuata. *Scapi* axillares, suberecti, 25–30 cm. longi, fusco-puberuli, vaginis ovatis paucis obtecti; racemi arcuati vel subnutantes, 8–11 cm. longi, densiflori. *Bracteæ* ovato-oblongæ, subobtusæ, 1·5–2 mm. longæ. *Pedicelli* fusco-pubescentes, 5–6 mm. longi. *Flores* parvi, extus fusco-pubescentes. *Sepalum* posticum late ovatum, obtusum, concavum, 4 mm. longum; sepala lateralia late triangulari-ovata, obtusa, 5 mm. longa; mentum clavato-oblongum, obtusum, 4 mm. longum. *Petala* falcato-oblonga, obtusa, membranacea, 3·5 mm. longa. *Labellum* subtrilobum, 5 mm. longum; lobi laterales oblongi, apice obtusi; lobus intermedius late ovatus, apiculatus, undulatus, 2 mm. latus; discus lævis. *Columna* lata, 1·5 mm. longa.

Hab. Kinabalu, Pakapaka cave, 10,000′, undergrowth in scrubby forest. Feb. 4302. Below Pakapaka, 9000′, epiphytic in low forest. Feb. 4227. Flowers brown.

Allied to the Javan *Eria acuminata*, Lindl., but having longer, more slender scapes, broader leaves, and much broader sepals.

*Eria (§Hymeneria) Gibbsiæ, *Rolfe*, sp. nov.

Herba epiphytica. *Rhizoma* validum, vaginis ovatis striatis imbricatis obtectum. *Pseudobulbi* suberecti, cylindrici, pluriarticulati, glabri, 15–20 cm. longi, vaginis spathaceis obtecti, ad apicem 3–4-phylli. *Folia* lanceolata vel anguste oblongo-lanceolata, subacuta, 12–18 cm. longa, 1–1·8 cm. lata, 5–7-nervia. *Scapi* ex axillis foliorum et vaginarum superiorum producti, 4–5, graciles, 8–12 cm. longi, glabri, laxiflori et multiflori. *Bracteæ* ovato-lanceolatæ, acutæ, 3–4 mm. longæ. *Pedicelli* graciles, glabri, 6–8 mm. longi. *Flores* parvi, glabri. *Sepala* subconniventia, 6 mm. longa, posticum oblongo-lanceolatum, acutum, subconcavum, lateralia subfalcato-lanceolata, acuta; mentum subsaccatum obtusum, 1 mm. longum. *Petala* lineari-lanceolata, acuta, 5 mm. longa. *Labellum* ovato-lanceolatum, acutum, subconcavum, 2·5 mm. longum; discus trinervis. *Columna* lata, 1 lin. longa.

Hab. Kinabalu, Kiau, 3000′, in sec. jungle. Feb. 3960. Flowers yellow.

Allied to *E. tenuiflora*, Lindl., but having taller stems, longer leaves, and much narrower sepals and petals.

ERIA (§Trichotosia) FEROX, *Blume, Mus. Bot. Lugd.-Bat.* ii. 184.

Kinabalu, Pakapaka, 9000–10,000′, in mossy forest. Feb. 4279. Flowers brown.

Distrib. Borneo (B. N. B. Kinabalu, 6000′, *Haviland* ; D. Borneo). Philippines, Java, Sumatra, and Malay Peninsula.

*ERIA (§Trichotosia) RUBIGINOSA, *Blume, Mus. Lugd.-Bat.* ii. 184.

Kinabalu, Gurulau spur, 5500′, on the ridge in primeval jungle. Feb. 4016.

I have not seen an original specimen of *E. rubiginosa*, Blume, but it came from Borneo, and has lanceolate leaves and a rusty-velutinous stem, not pilose, as in *E. ferox*, Blume, so that n. 4016 may belong here.

Distrib. Borneo (D. Borneo).

*ERIA (§Trichotosia) PILOSISSIMA, *Rolfe*, sp. nov.

Herba epiphytica, 0·75–1 m. alta. *Caules* cylindrici, subgraciles, rufo-pilosissimi, pilis 4–5 mm. longis. *Folia* sessilia, lanceolata, acuminatissima, utrinque pilosa, 10–12 cm. longa, 1·5–1·8 cm. lata. *Pedunculi* 4–5 cm. longi, rufo-pilosissimi, graciles, 4–5-flori. *Bracteæ* oblongo-lanceolatæ, acutæ, pilosæ, 7–8 mm. longæ. *Pedicelli* 5 mm. longi, pilosissimi. *Flores* mediocres, extus rufo-pilosi. *Sepalum* posticum elliptico-oblongum, obtusum, 7 mm. longum ; sepala lateralia oblique triangularia, obtusa, 8 mm. longa ; mentum oblongum, 7 mm. longum. *Petala* elliptico-oblonga, obtusa, 6 mm. longa. *Labellum* unguiculatum ; limbus trilobus, 5–6 mm. longus ; lobi laterales semiovati, obtusi, circiter 2 mm. lati ; lobus intermedius suborbicularis, crenulatus, bilobus, 3–5 mm. latus, lobis obtusissimis ; discus bicarinatus, carinis verrucosis ; unguis 4 mm. longus. *Columna* clavata, 3 mm. longa.

Hab. Kinabalu, above Lobang, 6000′, high forest. Feb. 4117. Flowers cream, with red tomentum.

Allied to *E. ferox*, Blume, but differing in having more slender stems with longer hairs, narrowly lanceolate leaves, and a more deeply lobed lip.

*PHREATIA DENSIFLORA, *Lindl. Gen. & Sp. Orch.* 64.

Kinabalu, above Lobang, 5000′, Feb. 4122 ; and in high forest, 6000′, Feb. 4123. Flowers white.

Distrib. Borneo (Sarawak, *Haviland*). Philippines, Java, Sumatra, and Malay Peninsula.

*PHREATIA (§Euphreatia) MONTICOLA, *Rolfe*, sp. nov.

Herba epiphytica, cæspitosa, ebulbosa, 8–11 cm. alta. *Caules* 2–3 cm. longi, vaginis foliorum imbricatis obtecti. *Folia* disticha, 6–8, linearia,

obtusa, arcuata, 6–8 cm. longa, 2–3 mm. lata ; vaginis conduplicatis imbricatis striatis 8–10 mm. longis obtecta. *Scapi* axillares, suberecti, 4–6 cm. longi ; racemi 2–3 cm. longi. *Bracteæ* 3–4 mm. longæ, basi ovato-oblongæ, apice longe setaceo-acuminatæ. *Pedicelli* 1–1·5 mm. longi. *Flores* minutissimi. *Sepala* subpatentia, late triangulari-ovata, subacuta, vix 1 mm. longa ; lateralia in mentum brevem saccatum producta. *Petala* ovato-oblonga, obtusa, vix 1 mm. longa. *Labellum* subsessile, orbiculare, 0·75 mm. longum. *Columna* minutissima.

Hab. Kinabalu, Kiau, 3000′, in sec. forest. Feb. 3959. Epiphyte, growing in large bunches. Flowers white.

Near *P. secunda*, Lindl., but having rather longer, more spreading leaves, longer more setaceous bracts, broader petals, and an orbicular lip.

*SPATHOGLOTTIS AUREA, *Lindl. in Journ. Hort. Soc.* v. (1850) 34.

Kinabalu, Kiau, 3000′, undergrowth in sec. forest. Feb. 3957. Flowers yellow.

The front lobe of the lip is narrowly lanceolate linear, as in Lindley's original type, not broadly dilated in front as in the following, which has been confused with it.

Distrib. Borneo (Sarawak). Malay Peninsula, Sumatra, Philippines.

SPATHOGLOTTIS GRACILIS, *Rolfe in Bot. Mag.* t. 7366.

Kinabalu, Dapatan, Maraiparai spur, 5000′, undergrowth in mossy forest. Feb. 4076. Flowers yellow.

This differs from the preceding, with which it has been confused, in having the front lobe of the lip suddenly dilated into a very broad apical limb.

Distrib. Borneo (B. N. B. Kinabalu, 4000′, *Haviland*). Malay Peninsula.

PHAIUS BLUMEI, *Lindl. Gen. & Sp. Orch.* 127.

Tambunan plain, 2000′. Feb. 3003.

Distrib. Java, Malay Peninsula, Burma, Assam, Sikkim, Fiji.

This has been more or less confused with *P. Wallichi*, Lindl., but the spur of the lip is much shorter than in that, and the sepals and petals invariably white at the back.

MISCHOBULBUM SCAPIGERUM, *Rolfe in Orch. Rev.* 1912, 127.

Nephelaphyllum scapigerum, Hook. f. Bot. Mag. t. 5390.

Tenom, hills above, 2000′, in high forest. Jan. 2884. Terrestrial. Leaves two shades of green. Flowers light brown, with purple veins on the lip.

Only known from the above-cited figure, with which Miss Gibbs's specimen agrees well, except in having rather larger leaves.

Distrib. Borneo (without precise locality).

*Ascotainia borneensis, *Rolfe*, sp. nov.

Herba terrestris. *Tuber* depresso-ovoideum, 1·5 cm. latum. *Folia* suberecta, longe petiolata; limbus elliptico-lanceolatus, acuminatus, plicatus, 25–30 cm. longus, 2·5–4 cm. latus; petioli graciles, 20–25 cm. longi. *Scapi* erecti, graciles, 45–60 cm. alti, vaginis spathaceis paucis obtecti; racemi 18–30 cm. longi, laxiflori. *Bracteæ* lineari-lanceolatæ, acuminatæ, 5–8 cm. longæ. *Pedicelli* graciles, 1·5 cm. longi. *Flores* parvi. *Sepala* lanceolata, acuta, 1·3 cm. longa. *Petala* lanceolata, acuminata, 1·3 cm. longa. *Labellum* obovatum, subtrilobum, subacutum, membranaceum, subundulatum, 1·3 cm. longum, 7–8 mm. latum; discus prope apicem tricarinatus; calcar oblongum, obtusum, incurvum, 3 mm. longum. *Columna* clavata, 1 cm. longa, late alata.

Hab. Kinabalu, Kiau, 3000′, in undergrowth in sec. jungle. Feb. 3958. Flowers brown-mauve.

Allied to *A. penangiana*, Ridl., but a more slender plant, with smaller flowers.

*Agrostophyllum sp.

Kinabalu, Maraiparai spur, 7000′, in mossy forest. Feb. 4034. Epiphyte, with white flowers.

Both the specimens are without flowers, and are therefore indeterminable. (This is the common condition of herbarium specimens of *Agrostophyllum*, apparently because these very fleshy plants take so long to dry that the capsules develop after gathering. The plants should be killed by scalding if possible, and a few flowers detached and dried separately in a folded piece of blotting paper.)

*Cœlogyne Sanderiana, *Reichb. f. in Gard. Chron.* ser. 3. i. (1887) 764.

Kinabalu, Kiau, bridle-path to Koung, 2500′, terrestrial in sec. jungle. Feb. 3971. Flowers white, with the disc of the lip yellow, streaked with brown, fragrant.

Distrib. "Sunda Islands."

*Cœlogyne Dayana, *Reichb. f. in Gard. Chron.* n. s. xxi. (1884) 826.

Kinabalu, Koung, 1000′, sec. forest. Feb. 4339. Epiphyte, with a pendulous inflorescence, 1 m. long, and brownish cream-coloured flowers.

Distrib. North Borneo (without precise locality) and Sumatra.

Quite distinct from *C. tomentosa*, Lindl., and *C. Massangeana*, Reichb. f., both of which have been confused with it. *C. Dayana*, Ridl. Mat. Fl. Mal. Penins. (excl. var. *Massangeana*, Ridl.) is *C. tomentosa*, Lindl.

Cœlogyne papillosa, *Ridl. in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 238.

Kinabalu, 8000–9000′, open scrub on the serpentine ridge. Feb. 4261. Flowers white.

Distrib. Borneo (B. N. B. Kinabalu, 10,000–10,500′, *Low*, *Haviland*).

*Cœlogyne exalata, *Ridl. in Journ. R. As. Soc. Straits, Br.* No. 49 (1908) 29.

Kinabalu, below Pakapaka, 9000′, terrestrial, in open scrub, abundant under *Leptospermum*. Feb. 4215. Flowers white.

Distrib. Borneo (Sarawak).

*Chelonistele lurida, *Pfitz. in Engl. Pflanzenr., Orch.-Cœlog.* 138.

Kinabalu, Maraiparai spur, 7000′, epiphytic in mossy forest. Feb. 4095. Flowers brown.

The general habit, as well as the shape of the lip, agrees so well with the above figure that I think both must belong to the same species.

Distrib. The original locality was not stated.

Sigmatochilus, *Rolfe*, gen. nov. (Pl. **3**.)

Sepala subæqualia, subpatentia, libera. *Petala* subpatentia, sepalis angustiora. *Labellum* ad basin columnæ sessile, basi incurvum et saccato-naviculare, medio subito recurvum et in limbum subpanduratum extensum; limbus basi bicarinatus; saccus graciliter bicarinatus. *Columna* erecta, apoda, brevis, basi alata, apice in alas oblongas amplas dilatata. *Anthera* intra marginem clinandrii affixa, opercularis, incumbens, 2-locularis; pollinia 4, cerea, oblonga, subcompressa, per paria in loculis segregata, apice appendice granulosa connexa.—*Herba* terrestris, cæspitosa, rhizomate longe radicante. *Pseudobulbi* ovoideo-oblongi, monophylli. *Folia* petiolata, elliptico-oblonga, coriacea. *Scapi* terminales. *Flores* mediocres, laxe racemosi. *Bracteæ* lanceolatæ, subdeciduæ.

Sigmatochilus kinabaluensis, *Rolfe*, sp. unica.

Pseudobulbi ovoideo-oblongi, 2·5–3 cm. longi, basi vaginis ovatis imbricatis obtecti, monophylli. *Folia* petiolata; limbus elliptico-oblongus, acutus, coriaceus, 5–8 cm. longus, 1·5–2 cm. latus; petioli 2–4 cm. longi. *Scapi* erecti, 7–10 cm. longi; racemi 2·5–3 cm. longi, distichi, laxiflori. *Bracteæ* lanceolatæ, acutæ, concavæ, 1–1·3 cm. longæ. *Pedicelli* 6–7 mm. longi. *Flores* mediocres. *Sepalum* posticum elliptico-oblongum, obtusum, cucullato-concavum, 1 cm. longum; sepala lateralia subpatentia, oblonga, obtusa, 1 cm. longa. *Petala* lineari-oblonga, subobtusa, 9 mm. longa. *Labellum* sepalis fere æquilongum; hypochilium naviculare, 4 mm. longum; epichilium subpanduratum, subacutum, subconcavum, 6 mm. longum, basi bicarinatum. *Columna* clavata, 5 mm. longa, basi alata, apice in alas oblongas emarginatas dilatata.

Hab. Kinabalu, below Pakapaka, 9000′, terrestrial, in open scrub on serpentine. Feb. 4260. Flowers white.

A very curious plant of the *Cœlogyne* group, closely resembling *Gymnoglottis*, J. J. Sm., in habit, but differing in having the lip free from the column, and strongly sigmatoid in shape, the latter character being commemorated in the generic name.

CALANTHE GIBBSIÆ, *Rolfe*, sp. nov.

Herba terrestris. *Folia* petiolata ; limbus elliptico-oblanceolatus, abrupte acuminatus, 5-nervis, 20–25 cm. longus, 6–9 cm. latus, basi attenuatus ; petiolus 7–8 cm. longus. *Scapi* 75–90 cm. longi, vaginis spathaceis paucis obtecti ; racemi 3–12 cm. longi, densi, multiflori ; rhachis puberula. *Bracteæ* ovatæ vel ovato-lanceolatæ, acuminatæ, recurvæ, 5–10 mm. longæ. *Pedicelli* graciles, 2·5–3 cm. longi. *Flores* mediocres. *Sepala* patentia, elliptico-oblonga, abrupte acuminata, 1·3 cm. longa. *Petala* oblongo-lanceolata, acuta vel acuminata, 1·1 cm. longa. *Labellum* columnæ adnatum ; limbus 3-lobus, 1·3 cm. longus ; lobi laterales late auriculati, 6–7 mm. longi ; lobus intermedius divaricate bilobus, basi angustus, 8 mm. longus, lobis cuneato-obovatis truncatis ; discus basi tuberculatus ; calcar gracillimum, circiter 2 cm. longum, apice incurvum. *Columna* clavata, 7 mm. longa.

Hab. Tenom, hills above, 2000′, undergrowth in high forest. 2870. Abundant. Flowers white, with yellow processes at the base of the lip.

Allied to *C. veratrifolia*, R. Br., but a more slender plant, with smaller bracts and flowers, and a more slender curved spur. Whether it is the plant alluded to by Ridley as *C. parviflora*, Lindl. (Trans. Linn. Soc. ser. 2. Bot. iv. 239) is uncertain, there being no specimen available for comparison at Kew, but it agrees in colour. It is not, however, Lindley's plant of that name, which is in Lindley's Herbarium, and has been referred to *C. flava*, Morren, by both Reichenbach and J. J. Smith.

*CALANTHE KINABALUENSIS, *Rolfe*, sp. nov.

Herba terrestris. *Folia* petiolata ; limbus ellipticus, acutus, plicatus, 3–5-nervis, 20–25 cm. longus ; 6–8 cm. latus ; petiolus circiter 10 cm. longus. *Scapi* 50–60 cm. longi, subgraciles, vaginis spathaceis paucis obtecti ; racemi 12–15 cm. longi, subdensi, multiflori ; rhachis puberula. *Bracteæ* lanceolatæ, acuminatæ, 6–13 mm. longæ. *Pedicelli* circiter 2 cm. longi. *Flores* parvi. *Sepalum* posticum oblongo-lanceolatum, subacutum, concavum, 9 mm. longum ; sepala lateralia elliptico-oblonga, subotusa, 1 cm. longa. *Petala* lanceolato-oblonga, subacuta, 9 mm. longa. *Labellum* columnæ adnatum, breviter unguiculatum ; limbus 3-lobus, 7 mm. longus ; lobi laterales elliptico-oblongi, obtusi, divergentes, 4–5 mm. longi ; lobus intermedius suborbicularis, ad medium bilobus, 5 mm. longus, lobis elliptico-oblongis obtusis ; discus basi tuberculatus ; calcar oblongum, obtusum, leviter incurvum, 6 mm. longum. *Columna* lata, subvillosa, 4 mm. longa.

Hab. Kinabalu, Lobang, 5000′, undergrowth in primary high forest, common. Feb. 4108. Also seen on the ridge above Bundu Tuhan. Flowers orange-yellow.

Allied to *Calanthe flava*, Morren, but the divisions of the front lobe of the lip broader and not diverging, and the spur shorter and stouter.

EULOPHIA MACROSTACHYA, *Lindl. Gen. & Sp. Orch.* 183.

Ridge above Bundu Tuhan, 2500′, sec. jungle. Feb. 4318. Terrestrial. Flowers yellow, with purple stripes on the lip.

Distrib. Borneo (D. Borneo). New Guinea, Sumatra, Ceylon, and South India.

I do not know how to separate this from the Mascarene *Eulophia pulchra*, Lindl., and suspect it is a geographical form of the same species.

EULOPHIA SQUALIDA, *Lindl. Bot. Reg.* 1841, *Misc.* 77.

Above Bundu Tuhan ridge, 2500′, in sec. jungle. Feb. 4319. Also at Kambarangau. Terrestrial.

Distrib. Borneo (B. N. B. Sandakan, *Creagh* ; Kudat, *Fraser* ; Labuan, *Motley* ; Sarawak). Philippines, Celebes, Java, Sumatra, Singapore, and Malay Peninsula.

ARACHNIS HOOKERIANA, *Schlechter in Fedde Repert. Nov. Sp.* x. 197.

Renanthera Hookeriana, Reichb. f. Xen. Orch. ii. 42, t. 113. fig. 2.

Arachnanthe alba, Ridl. in Trans. Linn. Soc. ser. 2. Bot. iii. 369.

Tambunan plain, near the Station, 2000′, gully in sec. forest. 3004. Terrestrial, growing upon trees, 6 m. high. Flowers in axillary racemes, cream-coloured with a mauve lip.

Distrib. Borneo (B. N. B. Labuan, *Motley*; Sarawak). Singapore and Malay Peninsula.

Schlechter has separated the Bornean and Malay Peninsula plants, but they appear to be identical. Ridley must have overlooked *Renanthera Hookeriana*, Reich. f. when describing his *Arachnanthe alba*, but he has included Borneo in the distribution.

PHALÆNOPSIS AMABILIS, *Blume, Bijdr.* 294, t. 44.

Tenom, 700–900′. Foot-hills and flanks round sec. forest. Jan. 2704′. Flowers white.

Distrib. Borneo (B. N. B. Banggi, *Fraser*). Tembulan Islands, Celebes, Buru, Timor Laut, Kei, and Java.

Probably the N.E. Queensland *Phalænopsis Rosenstromii*, Bailey, is not distinct, but I have not seen a specimen.

*TRICHOGLOTTIS KINABALUENSIS, *Rolfe*, sp. nov.

Herba epiphytica, circiter 20 cm. alta ; internodii 2·5 cm. longi. *Folia* lanceolata vel oblongo-lanceolata, inæqualiter bidentata, coriacea, 9–12 cm. longa, 1–1·3 cm. lata, dente superiore acuto. *Flores* laterales, fasciculati, pauci ; rhachis brevissima. *Bracteæ* squamatæ, brevissimæ. *Pedicelli* graciles, circiter 1 cm. longi. *Flores* parvi. *Sepala* oblonga, obtusa, 8–9 mm. longa. *Petala* lineari-oblonga, obtusa, 8–9 mm. longa. *Labellum*

trilobum ; lobi laterales lineares, obtusi, recurvi, 3 mm. longi ; lobus intermedius unguiculatus ; limbus late ovatus, obtusus, subcarinatus, 5 mm. latus ; unguis 2 mm. longus ; calcar oblongum, obtusum, 4 mm. longum. *Columna* clavata, 4 mm. longa. *Capsula* 3 cm. longa ; pedicellus 1·3 mm. longus.

Hab. Kinabalu, Gurulau spur, above Kiau, 5500′, in high forest jungle. Feb. 3993. Epiphyte, with brown flowers.

Much resembling *Trichoglottis quadricornuta*, Kurz, in habit, but the leaves rather more elongate and the lip quite different in structure. It is probably allied to *T. calcarata*, Ridl. (which I have not seen), but readily distinguished by the broad, reflexed unguiculate front lobe of the lip and the shorter spur.

*VANDA GIBBSIÆ, *Rolfe*, sp. nov.

Herba epiphytica, 1 m. alta. *Folia* disticha, numerosa, recurva, lineari-oblonga, inæqualiter et acute biloba, 15–17 cm. longa, 1·7–2 cm. lata. *Racemi* axillares, 5–7 cm. longi, 2–4-flori. *Bracteæ* late ovato-orbiculares, obtusæ, concavæ, 3–4 mm. longæ. *Pedicelli* 5–6 cm. longi. *Flores* speciosi. *Sepala* patentia, cuneato-obovata, obtusa, undulata, circiter 2·5 cm. longa, 1·2–1·4 cm. lata, basi angusta. *Petala* sepalis subsimilia. *Labellum* profunde trilobum ; lobi laterales oblique semiovata, obtusa, 8 mm. longa, subconcava ; lobus intermedius suberectus, carnosissimus, subcompressus, 1 cm. longus, basi angustus, cornubus 2 divergentibus pubescentibus instructus, deinde abrupte inflexus, suborbicularis, subcompressus, 5 mm. longus, concavus, tricarinatus ; calcar conico-oblongum, obtusum, 8 mm. longum, intus pubescens. *Columna* lata, 6 mm. longa, alis rotundatis integris. *Capsula* oblonga, angulata, 6 cm. longa ; pedicelli 4–4·5 cm. longi.

Hab. Kinabalu, Kiau, 2500′, bridle-path to Koung, in sec. forest. Feb. 3970. Epiphyte, 1 m. high. Flowers yellow, spotted with brown.

Comparable with *Vanda celebica*, Rolfe, in the sharply inflexed front lobe of the lip, but differing in its shorter regularly recurved leaves and larger flowers, which approach those of *V. tricolor*, Lindl., in size, and, like it, turn black in drying.

*SACCOLABIUM KINABALUENSE, *Rolfe*, sp. nov.

Herba epiphytica. *Caulis* erectus, circiter 6 mm. longus. *Folia* 5, oblonga vel elliptico-oblonga, inæqualiter biloba, obtusa, 6–11 cm. longa, 2–2·5 cm. lata, coriacea. *Racemus* elongatus, gracilis, circiter 22 cm. longus, laxus, multiflorus. *Bracteæ* triangulares, acutæ, 1·5–2 cm. longæ. *Pedicelli* graciles, 5 mm. longi. *Flores* parvi. *Sepalum* posticum ovato-oblongum, subobtusum, incurvum et valde concavum, 4 mm. longum ; sepala lateralia late ovata, obtusa, 3 mm. longa. *Petala* late ovata, obtusa, 3 mm. longa. *Labellum* profunde trilobum ; lobi laterales triangulari-oblongi, obtusi, erecti, 2 mm. longi ; lobus intermedius subulatus, acutus, erectus, 1·5 mm. longus ; calcar late oblongum, obtusum, prope basin oblique inflatum, paullo recurvum, 6 mm. longum. *Columna* lata, 2 mm. longa, alis latis rotundatis.

Hab. Kinabalu, Lobang, 5000′, in high forest. Feb. 4111. Epiphyte. Flowers yellow with a white lip.

Very distinct from any Bornean species known to me, and well characterised by the slender elongated raceme and relatively large spur.

*Podochilus serpyllifolius, *Lindl.*; *cf. Journ. Linn. Soc., Bot.* iii. (1858) 37.

Kinabalu, Dapatan and Penibukan ridges, 5000–6000′, in mossy forest. Feb. 4060. Epiphyte, with white flowers.

Distrib. Philippines and Java.

Appendicula congesta, *Ridl. in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 239.

Kinabalu, Penibukan ridge, 6000′, in mossy forest. Feb. 4058. Epiphyte. Flowers white.

Distrib. Borneo (Kinabalu, 11,000′, *Haviland*).

*Appendicula rupicola, *Rolfe*, comb. nov.

Podochilus rupicola, Ridl. in Journ. R. As. Soc. Straits Br. No. 50, 142.

Hab. Kinabalu, 1000′, Koung, sec. forest. Feb. 4301.

A fruiting specimen, agreeing well with this Bornean species in habit, hence referred to it with a little uncertainty. The withered segments remain at the apex of some of the fruits, but the lip is missing.

Distrib. Borneo (Sarawak).

Appendicula torta, *Blume, Bijdr.* 303.

Hills around Tenom, 1000–3000′, in high forest, common. Jan. 2897. Epiphyte with white flowers.

A form with slender stems and rather smaller, more numerous leaves.

Distrib. Borneo (Sarawak, *Haviland*). Java and Malay Peninsula.

*Goodyera kinabaluensis, *Rolfe*, sp. nov.

Herba terrestris, circiter 15 cm. alta. *Folia* radicalia, 3–4, breviter petiolata; limbus late ovatus, subobtusus vel apiculatus, velutinus, supra atroviridis, pulchre carneo-venosus, 4–5 cm. longus, 2·5–3·5 cm. latus; petiolus latus, 8–11 mm. longus, basi ample vaginatus. *Scapi* pubescentes, 10–12 cm. longi, vaginis ovato-lanceolatis obtecti; racemi breves, pauciflori. *Bracteæ* ovato-lanceolatæ, acuminatæ, pubescentes, 1–1·2 cm. longæ. *Pedicelli* 1·5 cm. longi. *Flores* mediocres, extus pubescentes. *Sepalum* posticum elliptico-ovatum, subacutum, 1·1 cm. longum; sepala lateralia subpatentia, elliptico-ovata, subacuta, 1·1 cm. longa. *Petala* lanceolato-oblonga, subacuta, cum sepalo postico galeam valde concavum formantia. *Labellum* ovato-ellipticum, subacutum, valde concavum, læve, 1·1 cm. longum. *Columna* lata, 7 mm. longa, angulis marginatis et supra dilatato-falcatis.

Hab. Kinabalu, Gurulau spur, above Kiau ridge, 5000–5500′, in primary forest. Feb. 3997, 4003. Leaves veined with pink. Flowers cream, pinkish outside.

A very distinct species, characterised by its broadly ovate, veined leaves, and by the winged margins of the column. The principal veins of the lip are seven to nine in number, and these are connected by numerous transverse veins, giving the plant an *Anœctochilus*-like appearance.

PLATANTHERA (§ Mecosa) STAPFII, *Kränzl. MSS.*

Herba terrestris, 40–45 cm. alta. *Folia* radicalia, elliptico-ovata, acuta, 6 cm. longa, 2 cm. lata, subcoriacea. *Scapi* 40–45 cm. alti, subgraciles, vaginis spathaceis acuminatis obtecti; racemi 9–11 cm. longi, pauciflori. *Bracteæ* ovatæ, subacutæ, 1–1·5 cm. longæ, subcoriaceæ. *Pedicelli* 1·5–2 cm. longi. *Flores* mediocres. *Sepalum* posticum ovatum, obtusum, 7 mm. longum; sepala lateralia patentia, oblique ovata, subobtusa, 7 mm. longa. *Petala* oblique ovata, acuta, cum sepalo postico galeam formantia. *Labellum* integrum, deflexum, ovato-lanceolatum, obtusum, carnosum, 1 cm. longum; calcar clavatum, paullo incurvum, obtusum, 1·2 cm. longum. *Columna* latissima, 3 mm. longa.

Hab. Kinabalu, 5000′, Maraiparai, *Haviland*, without number.

Differs from the Javan *P. Blumei*, Lindl., in its much more slender stem and laxer inflorescence, and in some respects also in its floral structure.

PLATANTHERA (§ Mecosa) KINABALUENSIS, *Kränzl. MSS.*

Herba terrestris, circiter 48 cm. alta. *Folia* radicalia non vidi. *Scapus* erectus, circiter 48 cm. altus, vaginis spathaceis acuminatis obtectus; racemus 10 cm. longus, subdensus, multiflorus. *Bracteæ* ovatæ vel ovato-lanceolatæ, acuminatæ, subcoriaceæ, 1·8–2·3 cm. longæ. *Pedicelli* 1·2–1·5 cm. longæ. *Flores* mediocres. *Sepalum* posticum late ovatum, obtusum, 7 mm. longum; sepala lateralia patentia, oblique ovata, obtusa, 8–9 mm. longa. *Petala* oblique ovata, obtusa, cum sepalo postico galeam formantia. *Labellum* integrum, deflexum, lineari-oblongum, obtusum, subcarnosum, 1 cm. longum; calcar subclavatum, paullo incurvum, 1·3 cm. longum. *Columna* latissima, 4 mm. longa.

Hab. Kinabalu, *Haviland.*

Allied to *P. Stapfii*, Kränzl., but the stem stouter, the inflorescence much denser, and the flowers larger. The original ticket has been lost, so that the altitude and number cannot be stated.

*PLATANTHERA (§ Mecosa) GIBBSIÆ, *Rolfe*, sp. nov.

Herba terrestris, circiter 50 cm. alta. *Folia* radicalia, spathulata; limbus elliptico-oblongus, subobtusus, 5 cm. longus, 1·8 cm. latus, subcoriaceus

petiolus 3 cm. longus. *Scapus* erectus, circiter 50 cm. altus, vaginis spathaceis acutis numerosis obtectus ; racemus 16 cm. longus, angustus, multiflorus. *Bracteæ* ovatæ vel lanceolato-ovatæ, acutæ, subcoriaceæ, 1·3–2 cm. longæ. *Pedicelli* 1·2–1·5 cm. longi. *Flores* mediocres. *Sepalum* posticum ovatum, subacutum, concavum, 6 mm. longum; sepala lateralia patentia, oblique et anguste ovata, subobtusa, 8 mm. longa. *Petala* oblique ovato-oblonga, subacuta, cum sepalo postico galeam formantia. *Labellum* integrum, deflexum, lineari-oblongum, subobtusum, carnosum, 1 cm. longum; calcar subclavatum, paullo incurvum, 1 cm. longum. *Columna* latissima, 3 mm. longa.

Hab. Kinabalu, below Pakapaka, 9000′, open scrub. Feb. 4258. Terrestrial. Flowers yellow.

Allied to *P. kinabaluensis*, Kränzl., but the flowers rather smaller, the sepals narrower, and the spur not exceeding the limb of the lip.

CORDULA DAYANA, *Rolfe in Orch. Rev.* 1912, 2.

Paphiopedilum Dayanum, Pfitz. in Engl. Jahrb. xix. (1894) 40.

Kinabalu, Koung, 1000′, sec. forest. Feb. 4347.

Distrib. Borneo (B. N. B. Kinabalu, *Low*).

Paphiopedilum, Pfitzer (Morph. Stud. Orchideenbl. 11), was based on the *Selenipedia acaulia coriifolia*, Reichb. f. Xen. Orch. i. 3 (a group of seven Tropical American species), but was afterwards extended (Engl. Jahrb. xix. 40) to include the whole of the Tropical Asiatic species. The two groups are generically distinct, and for the latter Rafinesque's genus *Cordula* is half-a-century earlier. *Cordula insignis*, Rafin. Fl. Tellur. iv. 46, was based on *Cypripedium insigne*, Wall., in 1836.

BURMANNIACEÆ.

BURMANNIA CŒLESTIS, *D. Don, Prod. Fl. Nep.* 44.

Jesselton, abundant, in open sandy places. Fl. Dec. 3066. Tambunan plain, 2000′, in bog. Fl. Feb. 3014.

Distrib. Borneo (Labuan, *Hose* ; Sarawak). Malaysia, N. Australia, Indo-China, and Mauritius.

BURMANNIA LONGIFOLIA, *Becc. Mal.* i. 244, t. 13. ff. 1–5.

Kinabalu, Maraiparai spur, 7000′, epiphytic in mossy forest. Fl. (white) Feb. 4053.

Distrib. Borneo (B. N. B. Kinabalu, 5000′, *Low* ; Sarawak). Malay Peninsula. Kindly determined by Mr. Rolfe.

SCITAMINEÆ. (H. N. Ridley.)

Globba propinqua, *Ridl. in Journ. R. As. Soc. Straits Br.*, No. 46 (1906) 230.

Tenom, Rayoh hills, 2500′, undergrowth in high forest, abundant. Fl. Jan. 2885.

Distrib. Borneo (Sarawak).

"Stem red, leaves with upper surface green and lower red. Flowers yellow."

Globba Gibbsiæ, *Ridl.*, sp. nov.

Caulis 54 cm. longus. *Folia* ovato-lanceolata, abrupte caudata, utrinque hispidula, 20 cm. longa (cauda 2 cm. longa), 7 cm. lata, petiolo 5 mm. hirto; ligula brevis, rotundata, hirta, vagina dorso hirta. *Panicula* (incompleta) 8 cm. longa, ramis 3 cm. longis, bracteis lanceolatis acuminatis 3 mm. longis. *Calyx* brevis, latus, infundibuliformis, lobis linearibus tubum fere æquantibus. *Corollæ* tubus 1 cm. longus, lobis late ovatis rotundatis. *Staminodia* angusta, oblonga, obtusa. *Labellum* perbreve, profunde bilobum, lobis oblongis, apicibus rotundatis, 2 mm. longis. *Filamentum* 1 cm. longum. *Anthera* non-marginata, processubus 2 e basi dorsi antheræ ortis angustis linearibus acuminatis antheræ æqualibus. *Capsula* oblonga, ovoidea, 1 cm. longa. *Pericarpium* glanduloso-punctatum.

Hab. Tenom, Rayoh hills, 2000′, undergrowth in high forest, abundant. Flowers white. Jan. 2872.

A curious plant in the very broad rounded petals and very short lip divided very nearly to the central channel and the anther-horns rising directly from the base and back of the anther. In some respects nearest to *Globba violacea*, Ridl., of the Malay Peninsula.

Globba Francisci, *Ridl.*, sp. nov.

Caulis bipedalis (0·70 m.). *Folia* oblonga, abrupte acuminata, basi angustata, 15 cm. longa, 6 cm. lata, glabra, subtus pallida, ligula brevissima rotundata parce pubescente. *Panicula* 21 cm. longa, gracilis, ramis elongatis ad 5 cm. longis gracilibus e basi ad dimidium nudis. *Bracteæ* lanceolatæ, acuminatæ, 2 mm. longæ, caducæ. *Calyx* infundibuliformis, angustus, lobis acuminatis brevibus 5 mm. longis. *Corollæ* tubus 10 mm. longus, lobis cymbiformibus acuminatis brevioribus. *Staminodia* lanceolata, acuminata, acuta. *Labellum* breve, oblongum, retusum, obtusum, omnia aurantiaca. *Filamentum* 2 cm. longum, antheræ processubus versus basin ortis, basi latis lanceolatis subabrupte acuminatis elongatis 3 mm. longis.

Hab. Tenom, 700–1000′, general in sec. forest undergrowth. Jan. 2932. Flowers orange.

Distrib. Dutch Borneo, Batu Bini, near Kendangau (*Grabowsky*); flowers cinnabar-red. In Herb. Brit. Mus.

Most nearly allied to *G. pendula*, Roxb., but with an almost complete entire lip, which does not seem to possess the usual brown central spot.

"This plant has been named after Mr. A. B. C. Francis, the Resident of the Interior, to whose kindness and courtesy I was indebted in many ways."

*CURCUMA ZEDOARIA, *Roscoe, Scitamineæ*, t. 109.
Kinabalu, Kiau, 3000′, undergrowth in sec. forest. Fl. Feb. 3956.
Distrib. Malay Peninsula, Celebes, Philippines; India and Ceylon.

COSTUS SPECIOSUS, var. ARGYROPHYLLUS, *Wall. Cat.* n. 6555 (1830).
Tenom, 700′, near cultivation and old "kebuns," in shade; general throughout the country. Fl. Jan. 2620.
Distrib. Malay Peninsula.

ALPINIA GALANGA, *Sw. Obs. Not.* 8.
Tenom, 700–1000′, general in sec. jungle. Fl. Fr. 2777.
Distrib. Moluccas, Amboina, Ceram Laut, Malaysia, India and Ceylon.
Does not seem to be known in a wild state anywhere.

*ALPINIA (§Hellenia) FLAVA, *Ridl.*, sp. nov.
Caules 2–2·50 metr. alti. *Folia* linearia, oblonga, acuminata, glabra, 40 cm. longa, 3·5 cm. lata, petiolis 5 mm. longis superne plano-concavis subtus convexis; ligula oblonga truncata margine ciliata, vagina cum ligula cancellata. *Panicula* laxa, patens, pedunculo terete 15 cm. (vel ultra) longo, parte florifera 24 cm. longa, ramis ad 6 subremotis, infimo 15 cm. longo. *Flores* dissiti, pedicellis 3 mm. longis. *Bracteæ* minutæ, ovatæ. *Calyx* rectus, coriaceus, amphoriformis, 7 mm. longus, lobis brevibus vix distinctis. *Corollæ* tubus quam calyx brevior, lobis linearibus oblongis, summo cucullato-carnoso, 7 mm. longis. *Labellum* brevius, obovatum, lateribus rotundatis, apice paullo angustato obtuso, ungue abrupte decurvo geniculato. *Stamen* filamento brevi crasso, anthera lata crassa. *Staminodia* linearia, oblonga, obtusa, majuscula.
Hab. Gurulau spur, above Kiau, 5000′, high forest, common. Flowers yellow. Feb. 4011.
Allied to *A. Nieuwenhuizii*, but with smaller flowers, a straight not gibbous calyx, and larger staminodes. The entire lip resembles that of *A. conchigera*, Griff.
The very short filament with the large anther bent at an abrupt angle and the long staminodes are distinctive characters.

ALPINIA (§ Catimbium) SERICEA, *Ridl.*, sp. nov.
Tria metra alta. *Folia* elongata, lanceolata, 78 cm. longa, 10 cm. lata, superne breviter dense hirta, inferne dense sericeo-hirsuta, ligula sericeo-

hirsuta 6 mm. longa, vagina pubescente. *Racemus* 2 dm. longus, rhachi et pedicellis (5 mm. longis) dense sericeo-hirsutis. *Bracteæ* 2 magnæ, oblongæ, basibus sericeis, apicibus bidentatis 3 cm. longis. Ovarium subglobosum, 5 mm. longum, sericeo-hirtum. *Calyx* spathaceus, ovatus, oblongus, sericeus, 2 cm. longus. *Petala* alba, oblonga, obtusa, 2 cm. longa, extus sericea, tubo 5 mm. longo. *Labellum* glabrum, 3 cm. longum, trilobum, lobis lateralibus oblongis marginibus latis undulatis, lobo medio anguste elongato, dimidium labelli æquante omnino aurantiacum rubro striatum. *Staminodia* ad labellum juncta, linearia, oblonga, obtusa, 5 mm. longa, dense sericea. *Anthera* glabra, 1 cm. longa.

Hab. Korikut, sec. forest, 2500′. Feb. 3025.

This species is allied to *A. illustris*, Ridl., of the Philippines, but differs from that and all species known to me in its long, very silky staminodes.

Donax canniformis, *K. Schum. in Engl. Bot. Jahrb.* xv. (1893) 440.

Tenom and Kaningau, 700–1000′, chief undergrowth in old clearings and sec. forest. Fl. Fr. Jan. 2644.

Distrib. Borneo (B. N. B. Banggi, *Fraser*; Sarawak; D. Borneo). Java, Celebes, Philippines, Aru and Admiralty Islands, New Guinea; Solomon Islands.

"The striped bark is valuable for tying; on one of Haviland's specimens at Kew, there is a note that it is used by the Malays for making mats."

Stachyphrynium Griffithii, *K. Schum. in Engl. Pflanzenr., Marant.* 45 (1902).

Tenom, 700′, undergrowth in sec. forest. Fl. Fr. Jan. 2909.

Distrib. Malay Peninsula.

"Forming large stools, the leaves including petioles being 3 m. long. Flowers white, with the outer perianth-whorl brownish and chartaceous."

HÆMODORACEÆ. (H. N. Ridley.)

Aletris rigida, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 241.

Kinabalu, Maraiparai spur, 4000–5500′, on serpentine, damp ground in the open and under scrub. Fl. Fr. Feb. 4041. On the south-western spur, from 9000–11,000′. Fl. 4234.

Distrib. Borneo (B. N. B. Kinabalu, 8000–11,000′, *Low*; in open damp places, 11,500′, *Haviland*).

Peliosanthes sp.

Tenom, 700′, undergrowth in sec. forest. Fr. (blue) Jan. 2864.

*OPHIOPOGON MALAYANUS, *Ridl. in Journ. R. As. Soc. Straits Br.*, No. 41 (1904) 34.

Kinabalu, Gurulau spur, 5000′, common undergrowth in high forest. Fl. Feb. 3996. Before Lobang, 4500′, in high forest. Fl. Feb. 4103.

Distrib. Malay Peninsula.

" Flowers greenish white, fruit bluish, 3996. Flowers pinkish, 4009."

IRIDACEÆ. (H. N. RIDLEY.)

PATERSONIA BORNEENSIS, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 42. pl. 20 A. 1–6.

Kinabalu, Kamburangau, 7500′, in a shallow sand-pan, amongst thick sedge tangle. Fl. Feb. 3124.

Distrib. Borneo (B. N. B. Kinabalu, 7700′, *Haviland*).

" Flowers mauve."

AMARYLLIDACEÆ. (H. N. RIDLEY.)

HYPOXIS AUREA, *Lour. Fl. Cochinch.* 200.

Kaningau Plain, 1000′, near Station, undergrowth in sec. forest. Fl. Jan. 2969.

Distrib. Philippines and Solomon Islands. Japan, China, Indo-China, India and Ceylon.

CURCULIGO LATIFOLIA, [*Dryandr. in*] *Ait. Hort. Kew.* ed. 2, ii. 253.

Tenom, 700–900′, general, undergrowth in sec. forest. Fl. Jan. 3123.

Distrib. Borneo (D. Borneo). Java, Malay Peninsula; Indo-China, Andamans, and Ceylon.

" Flowers yellow. The fibres of this plant are used by the Dusuns in spinning native cloth."

TACCACEÆ. (H. N. RIDLEY.)

TACCA PALMATA, *Blume, Enum. Pl. Jav.* i. 83.

Melalap, 900′, bridle-path to Kaningau. Fl. Jan. 2853.

Distrib. Borneo (Sarawak; D. Borneo). Java, Timor Laut, Philippines; Indo-China.

DIOSCOREACEÆ. (H. N. RIDLEY.)

*DIOSCOREA PYRIFOLIA, *Kunth, Enum. Pl.* v. 384.

Between Koung and Ghinambur, scrambling in sec. forest. Fr. Feb. 4297.

Distrib. Borneo (Sarawak). Malay Peninsula, Java, Sumatra, Billiton; Indo-China.

SMILAX LEUCOPHYLLA, *Blume, Enum. Pl. Jav.* 18. A et C.

Tenom, Rayoh hills, 2000′, in high forest on the ridge. Jan. 2877.

Distrib. Borneo (East Coast, *Creagh*: Kinabalu, 5000′, *Haviland*). Malay Peninsula, Java, Sumatra, Philippines, and Moluccas; Indo-China.

LILIACEÆ. (H. N. RIDLEY.)

*RHUACOPHILA JAVANICA, *Blume, Enum. Pl. Jav.* i. 14.

Dianella javanica, Kunth, Enum. Pl. v. 52.

Kinabalu, above Lobang rock, 5500,′ in high forest. Fl. Feb. 4157. (Burbidge in Herb. Kew.)

By some error this very distinct plant has been confused with *Dianella nemorosa*, Lam. for many years. The genus is readily distinguished from *Dianella* by the structure of the stamens, which in *Rhuacophila* have simple filaments swollen in the centre and narrowing gradually to both ends, while in *Dianella* the slender filiform filaments are dilated at the tip into a conspicuous yellow globose or subglobose thickening.

I met with *Rhuacophila javanica*, Blume, on Gunong Tahan in the north of Tahang in the Malay Peninsula, at an altitude of about 5000′, and received it also from Gunong Kerbau in Perak from a native collector. In my account of the last expedition to the Tahan mountain I described it as *Stypandra elata*, as that was the genus most nearly allied to it as I then conceived. Here it attained a height of over 2 m., and its leaves with white backs and its white flowers make it very distinct. The distribution of the plant is as follows:—

PHILIPPINE ISLANDS: Luzon, Benguet, Baguio, *Elmer*, 8590, 5797; Lepanto, Mt. Datá, *Micholitz*, and without precise locality, at 5000–7000′, *Whitehead*; Manila, Montalban, *Loher*; Albay, *Cuming*, 929; Mt. Mayon, *Vidal*, 1949. Negros Oriental, Dumaguete, Cuernos Mts., *Elmer*, 9726. Mindanao, Mt. Apo, *Williams*, 2556. TERNATE: summit of the island (*Moseley*). BORNEO: Kinabalu (*Gibbs*). JAVA: Mt. Gede (*Blume, Boerlage, Zollinger*), 1967, Pangerango (*Kurz*). MALAY PENINSULA: Gunong Tahan (Pahang), and Gunong Kerbau (Perak) (*Ridley*). SUMATRA: *Forbes* (2384, 1880).

PONTEDERIACEÆ. (H. N. RIDLEY.)

MONOCHORIA HASTÆFOLIA, *Presl, Rel. Hænk.* i. 128.

Tenggilan, 500′, open marsh and shallow ditches, common all through the country. Fl. Fr. March. 4343.

Distrib. Tropical Asia.

XYRIDACEÆ. (H. N. Ridley.)

Xyris pauciflora, *Willd. in Kunth, Enum. Pl.* iv. 17.

Kaningau plain, 1000′, in "Lalang" bog. Fl. Feb. 2972. Tambunan plain, near the Station, 2000′, boggy place in sec. forest. Fl. Feb. 3006.

Distrib. Malay Peninsula, Sunda Islands, Celebes, and Philippines; Indo-China, India and Ceylon.

Xyris anceps? *Lam. Illustr.* i. 132 (1791).

Jesselton, by the race-course, in boggy, sandy soil. Fl. Fr. Jan. 2595.

Distrib. Malaya; E. India.

COMMELINACEÆ. (H. N. Ridley.)

Pollia sumatrana, *Hassk. Commel. Ind.* 56.

Tenom, Rayoh hills, 2000′, undergrowth in high forest on the ridge, abundant. Fl. Fr. Jan. 2869.

Distrib. Philippines.

"Flowers white, fleshy."

Pollia sorzogonensis, *Endl. in Miq. Pl. Ind. Bat.* iii. 541.

Tenom, foothills, 900′, undergrowth in sec. forest. Fl. Jan. 2701. Patau Patau, 1500′, general in sec. forest. Fl. Feb. 3037.

Distrib. Malay Peninsula, Java, Ternate, Amboina, Buru and Philippines, New Guinea, and New Hebrides; Indo-China, India and Ceylon.

Commelina obliqua, *Ham. in D. Don, Prod. Fl. Nep.* 45.

Tenom, 700′, general, undergrowth in sec. forest. Fl. Jan. 2651.

Distrib. Malay Peninsula, Java; India and Ceylon.

"Erect, 0·70 m. in height, with light mauve flowers."

Cyanotis capitata, *C. B. Clarke in DC. Mon. Phan.* iii. 243.

Tenom, 800′, general, undergrowth in sec. forest. Fl. Jan. 2649.

Distrib. Malay Peninsula, Java, and Philippines; New Guinea; Japan, Indo-China.

"Of creeping habit, forming patches; flowers blue."

FLAGELLARIACEÆ.

Flagellaria indica, *Linn. Sp. Pl.* 333.

Jesselton, recent clearings and sec. jungle. Fl. Jan. 2584.

Distrib. Borneo (B. N. B. Port Myburgh, *Creagh*; Sarawak). Tropical Asia, Polynesia, Australia, E. Africa.

PALMACEÆ. (O. Beccari.)

Caryota mitis, *Lour. Fl. Cochinch.* 569.

Tenom, 700–900′, foothills and river banks, general in sec. forest. Fl. Fr. (young), Jan. 2698.

Distrib. Malay Peninsula, Java; Sudan and Coco Islands, Indo-China.

Areca Catechu, *Linn. Sp. Pl.* 1189.

Tuaran, 500′, in "campongs," old "kebuns," and in sec. forest. Cultivated throughout the country. Fl. Fr. March. 4305.

Distrib. Borneo (Sarawak). Throughout Malaya, China, Indo-China, and India.

*Pinanga capitata, *Becc.*, sp. nov.

Circiter 2 m. alta, caudice solitario cylindrico crebre annulato, frondibus ad apicem confertis. *Frondium* vaginæ exteriores longitudinaliter in ventre fissæ, interiores tubulosæ, omnes in capitulum congestæ; vaginæ 15 cm. longæ, fortiter striatæ; ligula lacero-fibrosa; petiolus brevis (4 cm. long.); lamina brevis (37 cm. longa, 15 cm. lata in specimine uno), circumscriptione oblonga, regulariter pinnata, segmentis utrinque 9 et duobus apicalibus, rigide chartaceis, lateralibus æquidistantibus lanceolatis rectis basi paullo attenuatis superne acuminatis plicato-2–3-costulatis 15–18 cm. longis 1·5–2 cm. latis, terminalibus basi unitis paullo latioribus 5–6-costulatis. *Spadix* fructifer erectus, unacum parte pedicellari (2 cm. longa) circiter 12 cm. longus, in 8–9 ramulos alternos sparsos sinuosos divisus. *Fructus* distichi, 11–12 mm. longi, 7 mm. lati, ovato-elliptici vel subobovati, in vertice rotundati et stigmatum residuis sessilibus punctiformibus coronati. *Semen* obovatum, superne rotundatum, basi arillo parvo præditum, areola embryonali laterali supra basin locata, rapheos ramis paucis ascendentibus laxissime anastomosantibus. *Perianthium* fructiferum cupulare, in ore paullo ampliatum, divisionibus rotundatis in margine ciliolatis et in medio minime apiculatis.

Hab. Kinabalu, Pakapaka, and on the way up to, 8000–10,000′, in mossy forest. Feb. 4219.

Species insignis, frondium vaginis fere in capitulum congestis et semine arillo minuto prædito præcipue distincta.

*Pinanga Gibbsiana, *Becc.*, sp. nov.

Mediocris, gregaria. *Frondium* pars pinnifera 1·5 m. longa; segmenta numerosa, æquidistantia, rigidula, utrinque glabra, subtus pallidiora, lateralia leviter sigmoidea, marginibus parallelis, 40–45 cm. longa, 2–2·5 cm. lata, 2-costulata et plicato-bisulcata; segmenta 2 terminalia basi confluentia, majora, pluricostulata. *Spadix* fructifer deflexus, parte pedicellari brevissima, in ramulos plurimos sparsos divisus, ramulis compressis 10–15 cm.

ongis. *Fructus* concinne biseriato-pectinati, 10 mm. longi, 5 mm. crassi, subobovato-elliptici, abrupte apiculato-rostrati. *Semen* ellipticum, foveola embrionali lateraliter basilari. *Perianthium* fructiferum cupulare, truncatum, in ore nec constrictum nec ampliatum, sepalis et petalis fere nitidis minime apiculatis in margine rotundatis et glabris.

Hab. Kinabalu, near Kiau, 2500′, gregarious in sec. forest. Feb. 3968.

P. cochinchinensi ut videtur proxima.

*DÆMONOROPS ELONGATUS, *Blume*, var. MONTANUS, *Becc.*, var. nov.

Scandens. *Cataphyllorum* vaginæ spinis horizontalibus seriatis armatæ. *Frondium* segmenta subæquidistantia, 2–3 cm. inter se dissita, ensiformia, acuminata, majora 40 cm. longa, 3 cm. lata, supra in costa media prope apicem spinulosa et secus 2 nervos secundarios setis nonnullis sparsa, subtus in costa media tantum crebre setosa, venulis transversis numerosissimis minutis brevibus fere granuliformibus utrinque notata. *Spadix* ♀ ut in forma typica. *Fructus* sphærici, 8·5–9 mm. diam., abrupte breviterque mucronati, squamis per series longitudinales 18 ordinatis, semine globoso, 6 mm. diametro.

Hab. Tenom, hills above, 2000′, abundant in high forest. Fr. Jan. 2893. Kinabalu, Gurulau spur, above Kiau, 5000′, in high forest. Fl. Feb. 3983.

A forma typica, Bornei meridionalis incola, differt frondium segmentis æquidistantibus et fructu sphærico minori squamis numerosioribus prædito. *D. Currani* Becc. e Philippinis quoque proximus, qui vero fructus majores et squamas per series 12–14 ordinatas exhibet.

DÆMONOROPS SABENSIS, *Becc.*, sp. nov.

Scandens. *Caudices* vaginati, circiter 2 cm. diam. *Cataphyllorum* vaginæ spinis laminaribus elongato-triangularibus majusculis majoribus 3 cm. longis 5 mm. basi latis sparsis vel basi confluentibus et oblique seriatis armatæ ; ocrea ligulæformis, dense hispida. *Frondes* (petiolo brevi præditæ) in parte pinnifera circ. 2 m. longæ, interrupte pinnatæ ; segmenta 6–10 per greges approximata et inter se equidistantia, tenuiter papyracea, utrinque virentia, ensiformia, acuminata, majora 30–40 cm. longa, 2–2·5 cm. lata, costa media in facie superiore valida et prope apicem spinulosa ibique nervis secundariis tenuibus nudis percursa, subtus in costa media et secus nervos secundarios nonnullos pilis spinuliformibus sparsa, marginibus minute remote et appresse spinulosis. *Spadicis* ♂ panicula stricta, paniculato-cupressiformis, parte pedicellari elongata inermi ancipiti suffulta ; spathæ primariæ deciduæ ; spicæ appressæ, complanatæ, majores 2–2·5 cm. longæ, 12–14 flores bifarie utrinque ferentes ; spathellæ dimidiato-infundibulares ; involucrum subdiscoideum. *Flores* ♂ approximati, oblongi, obtusi, 4–5 mm. longi,

1·5 mm. lati, calyce tubuloso-campanulato, superficialiter 3-dentato ; corolla quam calyx subduplo longior. *Spadix* ♀. *Fructus.*

Hab. Tenom, 700–900′, abundant in sec. forest. Jan. 2913.

D. sparsiflora ut videtur proximus, differt foliis interrupte pinnatis et segmentium textura tenuiori, subherbacea. Ad *D. longispathum,* Becc. quoque accedit, præcipue spicis ♂ graminum simillibus.

*Calamus Gibbsianus, *Becc.*, sp. nov., *in Ann. R. Bot. Gard. Calc. Suppl.* t. 29 (ined.).

Pakapaka, on the way up to, 8000–9000′, scrambling in mossy forest. Fl. Fr. Feb. 4348.

Calamus acuminatissimus, *Becc.*, sp. nov., *in Ann. R. Bot. Gard. Calc. Suppl.* t. 9 (ined.).

Tenom, 700′, in sec. jungle. Fl. Fr. Jan. 4349.

PANDANACEÆ. (U. Martelli.)

Pandanus dubius, *Spreng. Syst.* iii. 897.

Usakan Bay, seashore, on the sandy beach. Veg. March. 4334.

Distrib. Borneo (B. N. B. Gaya Island? *Burbidge*). Moluccas, New Guinea, and Marianne Islands.

"A very striking species from its broad glistening leaves. Only one isolated plant was seen, 2 m. high. Burbidge's specimen in the British Museum is only labelled N. Borneo, but he mentions the plant as common on Gaya ('The Gardens of the Sun,' 246)." (L. S. G.)

Pandanus Gibbsianus, *Martelli*, sp. nov.

Arbor 4 m. alta, ramosa. Folia 0·75–2·50 m. longa, 10–12 cent. lata (*Gibbs in lit.*). *Racemus* validus, ultra 50 cent. longus, pedunculo trigono, digiti majoris crassitie. *Syncarpia* 4–5 in extremitate pedunculi disposita, oblonga vel globosa, 12 cent. longa, 9 cent. lata. *Drupæ* numerosissimæ, confertæ, 3 cent. et ultra longæ, 6 mill. latæ, pentagonæ, utrinque attenuatæ, basi acutæ, pileo 1 cent. longo, 7 mill. lato, acute pentagono, granuloso-scabro, pyramidato, in stylum sensim attenuato, stylo longiusculo spinescente lævi. *Stigma* lineare, sursum vergens. *Caverna* mesocarpica supera oblonga, 8 mill. lata. *Endocarpium* in dimidio inferiore parte locatum, 1 cent. longum, basi acutum, superne planum.

Hab. Between Tambunan and Korikut, 3000′, on the ridges. Fl. Feb. 3030. Very common in sec. forest.

This belongs to the Section *Acrostigma*, and is a near ally of *Pandanus caricosus*, Kurz, from Java. It differs from the latter in the length of the trunk, in the breadth of its leaves, in the syncarps forming a raceme on the top of the peduncle, not solitary, and finally in the larger dimensions of the syncarps and drupes.

ARACEÆ. (H. N. Ridley.)

Epipremnopsis Hugeliana, *Engl. Pflanzenr., Arac.* 138.

Tenom, 1000′, abundant in sec. forest. Fl. Fr. Jan. 2682.

Distrib. Philippines.

"Spike white."

*Raphidophora Peepla, *Schott, Bonplandia*, v. 45 (1857).

Kinabalu, Gurulau spur, 8000′, above Kiau, in high forest. Fl. Feb. 4010.

Distrib. Borneo (Sarawak ; D. Borneo). Moluccas ; Indo-China, India, and Ceylon.

*Schismatoglottis caulescens, *Ridl. in Journ. R. As. Soc. Straits Br.* No. 44 (1905) 182.

Kinabalu, Kadamaian, 4000′, in high forest. Fl. Feb. 4100.

Distrib. Borneo (Sarawak).

"Spathe white, with yellow spadix."

*Arisæma simplicifolium, *Ridl.*, sp. nov.

Folium solitarium, ovatum, cordatum, glabrum, nervis ad 6 paria tenuibus in nervum marginalem arcuatis, 14 cm. longis, 8 cm. latis, petiolo 12 cm. longo. *Spatha* in pedunculo 14 cm. longo, vagina limbo lanceolato subacuto 3 cm. longo, tubo cylindrico 3 cm. longo 1 cm. lato viridi-rubro striato, lamina ovata lanceolata acuminata caudata 4 cm. longa, 2·5 cm. lata. *Spadix* appendice filiformi 10 cm. longo ; pars feminea 5 mm. longa, pistillis circiter 10, stylo brevi crasso, stigmate discoideo. *Flores* masculi ad 6, antheris 2–3-pedicellatis ; superne flores steriles (organa neutra) subulati, pauci.

Hab. Kinabalu, 3500′, near Kadamaian river, undergrowth in high forest. Feb. 4099.

Spathe green splashed with red, throat green and white.

Allied to *Arisæma umbrina*, Ridl., of Matang, which has its young leaves simple and ovate ; in this species all the leaves seem to be ovate, the limb of the spathe is wider, and the plant has neuter organs above the males, which I did not see in *A. umbrina*.

NAIADACEÆ. (A. B. Rendle.)

Naias graminea, *Del.*, var. angustifolia, *Rendle in Trans. Linn. Soc.* ser. 2. *Bot.* v. (1899) 424.

Tenom, 700′, clearing on railway track to Melalap, in a stagnant pool. Jan. 2820.

Distrib. Borneo (Sarawak). Malay Peninsula.

CENTROLEPIDACEÆ. (W. B. Turrill.)

*Centrolepis philippinensis, *Merrill in Philipp. Journ. Sci. Bot.* ii. (1907) 264.

Kinabalu, granite core, 13,000′, by the Kadamaian torrent, in small tufts. Fl. Fr. Feb. 4202. Summit, cracks in granite, forming mats. 4207.

Distrib. Philippines.

ERIOCAULACEÆ. (H. N. Ridley.)

Eriocaulon Hookerianum, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 243.

Kinabalu, Maraiparai spur, 5500′, in open damp places on serpentine and under trees. Fl. Feb. 3125.

Distrib. Borneo (B. N. B. Kinabalu, Maraiparai spur, 5500′, *Low*, 3000′, *Burbidge*; *Haviland.* Temburengo (Kamburangau), 7500–7700′, *Haviland*; Sarawak).

Eriocaulon xeranthemum, *Mart. in Wall. Pl. As. Rar.* iii. (1832) 29.

Jesselton, near the race-course, sandy open bog, abundant. Fr. Jan. 3077.

Distrib. India, Penang.

Eriocaulon truncatum, *Ham. ex Mart. in Wall. Pl. As. Rar.* iii. (1832) 29.

Jesselton, near the race-course, sandy open bog, abundant. Fl. Jan. 2597, 2602 *bis.*

Distrib. Malay Peninsula, Java, Philippines; Indo-China, India and Ceylon.

Eriocaulon sexangulare, *Linn. Sp. Pl.* 87.

Jesselton, near the race-course, sandy open bog, abundant. Fl. Jan. 2596.

Distrib. Philippines; China, Indo-China, India and Ceylon.

CYPERACEÆ. (O. Stapf & W. B. Turrill.)

*Cyperus Haspan, *Linn. Sp. Pl.* ed. 2, 66 (in part); *C. B. Clarke in Hook. f. Fl. Brit. Ind.* vi. 600.

Melalap, 800′, sandbanks up the Pengallan river. Fl. Jan. 2757. Tenom, 700′, in ditches along the bridle-path. Fl. 2679. Kinabalu, Kiau, 3000′, abundant in paddy fields. Fl. Feb. 3967.

Distrib. Borneo (B. N. B. N.E. Coast, *Creagh*; Labuan, *Motley*, 194; Dutch South-East Borneo, Danau Salac, near Martapura, *Motley*, 98). All warm countries.

Cyperus pubisquamus, *Steud. in Zoll. Verz. Ind. Archip.* ii. 62, *and in Syn. Cyp.* 20.

Tenom, 900′, in sec. jungle. Fl. Jan. 2696.

Distrib. Borneo (Labuan, *Motley*, 327). From the Malay Archipelago to Assam and Ceylon.

Cyperus Iria, *Linn. Spec. Pl.* ed. 2, 67.

Melalap, 900′, sandbanks up the Pengallan river. Fl. Jan. 2748.

Distrib. Borneo (Labuan, *Motley*, 52; Dutch S.E. Borneo, at Martapura, *Motley*, 620). Warm parts of the Old World.

Cyperus distans, *Linn. f. Suppl.* 103.

Tenom, 700′, in a ditch along the bridle-path, common. Fl. Jan. 2674.

Distrib. Borneo (Brunei, *Motley*, 305; Dutch S.E. Borneo, Martapura, *Motley*, 91). All warm countries.

Cyperus Zollingeri, *Steud. in Zoll. Verz. Ind. Archip.* ii. 62, *and Syn. Cyp.* 17.

Tenom, 800′, in open clearings near the "Residency." Fl. Jan. 2784.

Distrib. Borneo (Brunei, *Motley*, 305; Dutch S.E. Borneo, Martapura, *Motley*, 90). Throughout the tropics of the Old World.

Cyperus elatus, *Linn. Sp. Pl.* ed. 2, 67.

Tenom, 700′, stagnant water in sec. jungle, growing in tufts. Fl. Jan. 2654.

Distrib. Borneo (Dutch S.E. Borneo, Rancha Serang, near Martapura, *Motley*, 981). Malayan Region, Indo-China, and Deccan Peninsula.

Mariscus Sieberianus, *Nees in Linnæa*, ix. (1834) 286. *M. umbellatus* var. *Sieberianus*, E. G. Camus in Lecomte, Fl. Indo-Chin. vii. 78.

Melalap, 800′, sandbanks up the Pengallan river. Fl. Jan. 2746.

Distrib. Borneo (Labuan, *Motley*, 75; Dutch S.E. Borneo, Martapura, *Motley*, 17). Throughout the tropics.

MARISCUS MICROCEPHALUS, *Presl, Rel. Hænk.* i. 182; *C. B. Clarke, in Hook. f. Fl. Brit. Ind.* vi. 624.

Sphæromariscus microcephalus, Camus, l. c. 79.

Tenom, 700′, in ditches along the bridle-path to Melalap. Fl. Jan. 2663.

Distrib. Borneo (B. N. B. N.E. Coast, *Creagh*; Melingtang on the Kapala river, a most elegant plant in pepper gardens, *Motley*, 443). Indo-Malayan region and Mauritius.

KYLLINGA BREVIFOLIA, *Rottb. Descr. et Icon.* 13, fig. 3.

Tenom, 700′, in ditches along the bridle-path, common. Fl. Jan. 2672.

Distrib. Borneo (Labuan, *Motley*, 41, 159, 172; Sarawak, near Kuching, *Haviland*, 1936; Dutch S.E. Borneo, near Martapura, *Motley*, 89).

SCIRPUS CLARKEI, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 244.

Kinabalu, summit, 12,000–13,000′, cracks in granite. Fl. Feb. 4190, 4195.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*—in a taller state, 1398).

Apart from the shorter stems—most of the flowering ones are only 15 cm. high though those of the last season measure as much as 30–35 cm.—Miss Gibbs's specimens agree entirely with those collected by Haviland at a lower elevation, and they confirm me in my view that *S. Clarkei* is distinct from *S. subcapitatus*, Thw. To the characters emphasized as distinctive in my original description I would now add the distinctly barbellate condition of the 6 setæ. They are about twice as long as the caryopsis and barbed in their upper half, the papillæ exceeding the diameter of the bristle. (O. S.)

*SCIRPUS PAKAPAKENSIS, *Stapf*, sp. nov.; arcte affinis *S. Clarkei*, Stapf, *S. subcapitato*, Thw., ab illo spiculis fere semper 3–2-nis, inferioribus pedunculo 1–2 cm. longo gracili suffultis, glumis magis elongatis (etiam inferioribus) vel acuminatis, ab hoc inflorescentia laxa et setis conspicue barbellatis distinguendus.

Rhizoma breve, fibrosum, culmos numerosos dense fasciculatos in cæspites compactos collectos edens. *Culmi* 0·3–1 m. alti, teretes, sulcato-striati, læves, 1–1·5 mm. diametro, ad 10–15 cm. vaginati. *Folia* cum culmo quoque 4–5, ima 2–3 cataphylloidea, ad vaginas tenuiter striatas fuscescentes 1–2·5 cm. longas laminam apiculiformem gerentes reducta, sequentia longe vaginantia, ore summæ vaginæ 10–15 cm. a basi culmi remoto, eius lamina lineari vel lanceolato-lineari acuta 5–18 mm. longa 1–1·5 mm. lata in margine scabra. *Spiculæ* 3–2 in apice culmorum fasciculatæ, rarissime in culmis debilitatis solitariæ, inferiores 2 vel 1 bractea suffultæ, pedunculatæ; bracteæ lanceolatæ vel oblongæ, 4 mm. longæ, nervo dorsali viridi in apiculum vel setulam

1–2·5 mm. longam excurrente; pedunculi graciles, 0·1–2·5 cm. longi; spiculæ inferiores 0·5–1 cm., summa subsessilis ad 1·5 cm. longa, omnes oblongæ, laxiusculæ. *Glumæ* spicularum lateralium ad 8, rarius 10, omnes fertiles, terminalis 2 infimæ vacuæ, cæteræ 10–12 fertiles; glumæ vacuæ late oblongæ, mucronulatæ, 4·5 mm. longæ, 3–1-nerves, fertiles lanceolatæ, acutæ, vel acuminatæ, 5–6 mm. longæ, nervo dorsali inferne lato viridi, lateribus castaneis margines versus pallescentibus. *Perianthii* setæ 6 capillares, inferne valde flexuosæ, superne laxe barbellatæ, 6 mm. longæ, barbæ papillis diametro setæ multo longioribus. *Stamina* 3; filamenta 6 mm. longa; antheræ haud visæ. *Stylus* glaber, ad 2 mm. indivisus, ramis stigmatosis 3, fere 3 mm. longis. *Caryopsis* fusca, obovato-oblonga, trigona, apice ob basin styli persistentem breviter apiculata, 2 mm. longa.

Hab. Kinabalu, below Pakapaka, 9000–10,000′. Fl. Feb. 4277. In boggy places under trees.

Distrib. Endemic on Kinabalu.

This, with *S. Clarkei*, *S. subcapitatus* from Ceylon and the Deccan Peninsula, and two other species from Sumatra and the mountains near Kiukiang (Province Kiangsi in China, both referred to *S. subcapitatus* by C. B. Clarke) form a group of closely allied but geographically widely separated species. *S. pakapakensis* approaches most closely the Kiukiang plant, which differs mainly in having the lowest spikelet subsessile whilst the following, if more than one, are more or less distantly arranged on a slender axis, and in the smaller, frequently more acute glumes.

FIMBRISTYLIS DIPHYLLA, *Vahl*, *Enum.* ii. 289.

Tenom, 800′, in an open clearing near the Residency, 278. Melalap, 800′, on sandbanks up the Pengallan river. Fl. Jan. 2747. Kaningau plain, 1000′, near the "Station." Fl. Jan. 2949.

Distrib. Borneo (B. N. B. N.E. Coast, *Creagh*; Labuan, *Motley*, 66; Sarawak, near Kuching, *Haviland*, 1919; near Serup, Matang, *Ridley*, 12,310). All warm countries.

FIMBRISTYLIS ASPERRIMA, *Boeck. in Linnæa*, xxxvii. (1873) 40 (ex parte).

Tenom, foothills, 900′, in sec. forest. Fl. Jan. 2690, 2694.

Distrib. Borneo (Sarawak, *Beccari*, 2738). Malayan region and Ceylon.

FIMBRISTYLIS MILIACEA, *Vahl*, *Enum.* ii. 287.

Jesselton, in a bog near the race-course. Yg. Dec. 2599. Tenom, 800′, in open clearings. Fl. Feb. 2785. Melalap, 800′, sandbanks up the Pengallan river. Fl. Jan. 2751.

Distrib. Borneo (B. N. B. N.E. Coast, *Creagh*; Labuan, *Motley*, 173; Sarawak, near Kuching, *Haviland*, 1918. Dutch S.E. Borneo, Rancha Serang, *Motley*, 991; near Sungei Penug, *Motley*, 92). All warm countries.

Another specimen collected by Miss Gibbs in a ditch by the bridle-path to Melalap, at 700′ (No. 2681), is possibly referable to *F. miliacea.* It has quite the facies of this species, but the spikelets are rather longer, with the glumes less bulging and the ultimately bare rhachis slightly stouter. To this may be added certain anatomical differences in the stems and leaves. In *F. miliacea* there are, apart from the great primary vascular bundle, 4–8 small ones to each face of the quadrangular stem, in No. 2681, on the other hand, only 2. The leaves of *F. miliacea* in its typical form have numerous nerves on each face with large lacunæ alternating with them, and leaving only a narrow zone of parenchymatic tissue in the median plane, whilst those of No. 2681 are solid throughout with only half as many nerves and a very large-celled parenchyma in the middle. They are also on the whole narrower. Striking as the differences may appear at first sight, they may after all come within the limits of the ordinary fluctuation of the structure of the stems and leaves of *F. miliacea.* To decide this much more material would be required.

FIMBRISTYLIS COMPLANATA *Link*, *Hort. Berol.* ed. 2, i. 292.

Kaningau plain, 1000′, in clear marshland near the "Station." Fl. Jan. 4353.

Distrib. Borneo (Dutch S.E. Borneo, Wongabong, near Martapura, *Motley*, 84). All warm regions.

FIMBRISTYLIS LACEI, *Turrill in Kew Bull.* 1911, 348.

Tenom, 800′, along paths in recent clearings near the "Residency." Fl. Jan. 2771.

Distrib. The only other locality so far known is in Upper Burma.

*SCHŒNUS KINABALUENSIS, *Stapf,* sp. nov.; affinis *S. apogoni,* Roem. & Schult., sed spiculis solitariis vel geminatis majoribus unifloris antheris multo longioribus, setis longioribus, nuce duplo majore.

Herba perennis, dense cæspitosa, 10–15 cm. alta vel in umbrosis magis elongata. *Caules* tenues, subfiliformes, erecti vel in umbrosis e basi prostrata, ramosa ascendentes. *Foliorum* vaginæ arctæ, 10–15 (vel ultra) mm. longæ, atro-purpurascentes, superne anguste albo-hyalino-marginatæ, nitentes; laminæ setaceæ, rigidulæ, dorso rotundatæ, facie leviter concavæ, 5–10 cm. longæ, glaberrimæ, ad margines remote scaberulæ. *Spiculæ* solitariæ vel geminatæ e vaginis superioribus ortæ, pedunculis inæquilongis vel summis brevissimis, lamina summa sæpissime superatæ, lanceolatæ, atropurpureæ, 7–7·5 mm. longæ, glaberrimæ, 1-floræ. *Glumæ* duæ vel tres inferiores vacuæ, 3 mm. longæ, acutæ vel mucronulatæ, in carina superne asperulæ; tertia vel quarta lineari-oblonga, obtusiuscula vel acuta, 5 mm. longa, florem subtendens; summa præcedenti similis, eam paulo superans, fere

semper obtusiuscula, vacua, basi utrinque in rhachillæ articulum ad 2 mm. longum decurrente et florem amplectente. *Setæ* 6, tenuissimæ, minutissime barbellatæ, exteriores sub staminibus ortæ, ovarii angulis oppositæ, 3 mm. longæ. *Stamina* 3, filamentis 5 mm. longis, antheris 4 mm. longis. *Ovarium* oblongo-ellipsoideum, subtrigonum; styli rami 3 e gluma summa exserti. *Nux* 2 mm. longa, ad angulos tenuiter costata.—*S. apogon*, C. B. Clarke in Trans. Linn. Soc. ser. 2. Bot. iv. (1894) 245, non Roem. & Schult.

Near Pakapaka cave, under wind-swept scrub, 9000′. Fl. 4220. In cracks of the granite core, 13,300′. 4188, 4198.

Distrib. Borneo (B. N. B. Kinabalu, 9000′, *Low*; 12,000–13,000′, *Haviland*).

Low's plant represents the same drawn-out shade condition as Miss Gibbs's no. 4220 from Pakapaka.

Clarke says of *Schœnus* that the adaxial stamen and the nearest 2 lateral stamens are suppressed in the 5 staminate flowers, so that the 3 remaining stamens are all on one side of the flower. I find in *S. apogon* and *S. kinabaluensis* invariably the outer 3 stamens, *i. e.* those opposite to the ribs of the nut developed, each having one of the outer bristles below it, whilst the inner bristles alternate with them. As described above, the blades of *S. kinabaluensis* are rounded on the back and channelled above with 3 faint longitudinal ridges corresponding to as many sclerenchymatic strands, one of which is median and the others lateral. In *S. apogon* the leaves are grooved on the back, and there are only two sclerenchymatic strands corresponding to the lateral of *S. kinabaluensis*. The number of vascular strands is 5 in *S. kinabaluensis* and 4 in *S. apogon*, the median being absent in the latter.

SCHŒNUS MELANOSTACHYS, *R. Br. Prod.* 231.

Kinabalu, Maraiparai spur, 5000′, on the marshy open serpentine ridge. Fl. Feb. 4038.

Distrib. Borneo (B. N. B. Kinabalu, Maraiparai, 5500′, *Haviland*). Philippines (Mt. Halcon, *E. D. Merrill*, 6173). Queensland to New South Wales; West Australia.

I am not quite certain that the Borneo and Philippine plants are identical with the Australian *S. melanostachys.* The spikelets are fewer and slightly smaller and apparently always 1-flowered, with only 4 barren glumes below the fertile. They also taper less gradually to the point. The Borneo and Philippine specimens may, however, be merely "plantæ depauperatæ."

SCHŒNUS sp.

Maraiparai spur, 5000′, on the open marshy serpentine ridge. Feb. 4075 (very imperfect).

Distrib. "Predominating in parts, associated with *Eria grandis*." (L. S. G.)

VINCENTIA MALESIACA, *Stapf*, sp. nov.; affinis *V. samoensi*, Stapf (*Cladio samoensi*, C. B. Clarke, in parte), sed spiculis robustioribus 6–6·5 mm. (haud 4–4·5 mm.) longis, filamentis et stylis longioribus distincta.

Cæspites rhizomati brevi fibras crassas cylindricas edenti insidentes. *Caules* 0·7–1 (vel ultra?) m. alti, ancipites, lævissimi, in speciminibus robustis ad 4 mm. lati, infra medium 1-foliati, basi cataphyllis duris lanceolatis peracutis 2–8 cm. longis lamina destitutis vel fere destitutis obtecti. *Folia* omnia equitantia, linearia acuta vel subacuta, basalia ad 10 cm. vel ultra vaginantia, cum parte vaginali 25–70 cm. (vel ultra?) longa, 0·7–1·5 cm. lata, rigida, firma, multi-nervosa, nervis tenuibus paulo prominulis, caulinum ad longum. *Panicula* 10–25 cm. longa, ex anthelis 2 vel 3 magis minusve distantibus composita, multiflora, anthelæ infimæ bractea late vaginante laminam brevem ensiformem gerente 1–3 cm. longa, cæteræ bracteis similibus sed brevioribus at sæpe valde reductis suffultæ; anthelarum rami pauci vel numerosi, valde inæquales, longiores ad 8 cm. longi et ad 6 cm. indivisi, superne magis minusve ramulosi; ramuli fasciculati et inæquales, uti rami pubescentes, longiores paria (rarius triones) spicularum pluria dissita, cæteri par unum terminale gerentes; bracteæ latiuscule vaginantes, setuligeræ, atro-purpureæ vel atro-fuscæ, antice pubescentes vel saltem in ore obliquo ciliatæ. *Spiculæ* 6–6·5 lin. longæ, 2-floræ, atro-purpureæ vel atro-fuscæ, inferior sessilis, altera brevissime pedunculata, inferior cum prophyllo bicarinato 2 mm. longo. *Glumæ* subdistichæ, infima spiculam dimidiam æquans vel paulo brevior vacua (in spicula pedunculata terminali bracteæ par subtendenti homologa et eam sæpe forma pubeque magis minusve appropinquans), secunda tertiaque fertiles, tertia secundam paulo superans, quarta brevior ut quinta minuta vacua, secunda a latere visa oblique lanceolata, subacute vel acute acuminata, 5 mm. longa, firma, luce transmissa obscure nervosa, nervis utrinque circiter 6, tertia a latere visa suboblique oblonga, obtusiuscula vel minutissime mucronulata, 5·5 mm. longa, cæterum secundæ consimilis, quarta forma tertiæ sed tenuior. *Flos* inferior superiorem evolutione longe antecedens et ut videtur interdum solus fructum maturans. *Perianthemum* nullum. *Stamina* 3 rarius 4 vel 6; filamenta 6–7 mm. longa, filiformi-linearia; antheræ 2–2·5 mm. longæ, lineari-oblongæ, apiculatæ. *Ovarium* stipitatum, sensim in stylum 2·5 mm. longum abiens. *Stigmata* 3·3–3·5 mm. longa. *Nux* obovoidea, trigona, 3·5 mm. (vix matura) longa, stipitata, styli basi pyramidato-subulata minute papillosa coronata.—*Cladium samoense*, C. B. Clarke in Trans. Linn. Soc. ser. 2, Bot. iv. 245 (quoad Haviland, 1405).

Kinabalu, 9800–10,500′, undergrowth in low forest, Pakapaka. Feb. 4278.

Distrib. High mountains of Sumatra, Borneo, and the Philippines.

I am inclined to refer to this species a plant collected by Beccari on Mt. Singalan, Sumatra (n. 213) and Merrill's *Cladium latifolium*, described in 'Philippine Journal of Science,' ii. (1907) 262, of which I have seen the following specimens: R. S. Williams, no. 2614, from Mt. Apo, Mindanao,

collected at 7500′, and Loher, 6975, from Mt. Banahao, Luzon (also collected in 1906) at 7500′. The latter locality is the *locus classicus* of the species. Foxworthy found it there in 1907.

I have taken *Vincentia* here in the sense of Hooker and Bentham's 'Genera Plantarum,' where, however, it is treated as a section of *Cladium*. The latter genus ought, in my opinion, to be restricted to *C. jamaicense* and its immediate allies, or, in other words, to the section *Eucladium*. On the other hand, *Baumea falcata*, Nees, and possibly other species referred to *Baumea*, will have to be treated as congeneric with *Vincentia*. The West Indian *Machærina*, Vahl, also approaches so closely to *Vincentia* that its claim to generic rank may be questioned. To define the limits of *Vincentia* more satisfactorily, it will be necessary to subject the Australian and New Zealand species of "*Cladium*" to a careful revision. For the purposes of the present paper it will suffice to point out the very close relationship of the Malayan species recorded from Kinabalu with *V. Maingayi*, Stapf (*Cladium Maingayi*, C. B. Clarke) from the Celebes, the Philippine *V. falcata*, Stapf (*Baumea falcata*, Nees) and the Mascarene *V. latifolia*, Kunth, on the one side, and the Polynesian species, *V. samoensis*, Stapf (Samoa), *V. angustifolia*, Gaud. (Sandwich Islands), and a doubtful species from the Society Islands (*Bidwill*) which may be identical with *V. scirpoidea*, Boeck. from Juan Fernandez, on the other side.

LEPIDOSPERMA CHINENSE, *Nees in Linnæa*, ix. 302 (nomen); *in Nov. Act.* xix. Suppl. I. (1843) 117.

Cladium borneense, C. B. Clarke in Trans. Linn, Soc. ser. 2. Bot. iv. (1894) 245.

Kinabalu, Maraiparai spur, 5000′, on open rocks of the marshy serpentine ridge. Feb. 4037.

Distrib. Borneo (B. N. Borneo, *Low*; Kinabalu, at the same elevation plain of Tamparuli, *Burbidge*). Malay Peninsula, South China, and North Borneo.

LOPHOSCHŒNUS, *Stapf*, gen. nov.

Affinis *Schœno*, Linn. (sensu Benth.), sed inflorescentia ampla paniculata, spiculis solitariis vel geminatis sæpe magis minusve pedunculatis, rhachilla inter et ultra flores plerumque haud vel breviter producta, perigonii setis nuce longioribus barbatis vel plumosis distincta.

Spiculæ angustæ, 2-floræ, flore inferiore abortu ♂, superiore ♀. *Glumæ* distiche imbricatæ, inferiores 5–8 vacuæ, a basi sursum gradatim majores, sequentes 2 (vel 1) florigeræ quam præcedentes longiores, summa brevis, vacua, rhachilla haud flexuosa glumis delapsis cicatricibus arcte approximatis notata, internodio summo plerumque vix elongato et quam nuces semper multo breviore in una specie vero longiuscule producto. *Setæ* hypogynæ 6, nucibus longiores, rigidulæ, barbatæ vel plumosæ. *Stamina* 3. *Stylus* cum ovario

continuus, ramis stigmatosis 3 filiformibus. *Nux* sessilis, ovoidea, triquetra, stylo vel styli basi persistente cuspidata, filamentis perigoniique setis persistentibus circumdata.—*Herbæ* perennes, caulo elato, foliato. *Folia* longa, plurima ad basin caulis conferta. *Panicula* ampla, longa, ramis ramulisque gracilibus interdum nutantibus, spiculis numerosis solitariis magis minusve pedunculatis vel geminatis et tunc una sæpe breviter pedunculata altera sessili.

Cyclocampe, Benth. in Bentham & Hooker, Gen. Plant. iii. 1063, *non* Steud.

LOPHOSCHŒNUS URVILLEANUS, *Stapf*, comb. nov. *Carpha arundinacea*, Brongn. in Duperr. Voy. Coq. 170, xxx. (1829); *C. Urvilleana*, Gaud. ex Nees in Linnæa, ix. (1835) 300 (nomen); Boeck. in Linnæa, xxxviii. (1874) 272; *Asterochæta arundinacea*, Kunth, Enum. ii. 312, in part (1837).

Hab. Kinabalu, Maraiparai spur, 5500′, in an open boggy area. Feb. 4094.

I have identified Miss Gibbs's plant with the one collected by Urville in the island of Waigiou, but have to point out that her specimens have much longer peduncles and that generally their lowermost glumes are more or less awned. Otherwise the resemblance is so great that to separate them on those characters only seems to be unjustified, the more so, as I know Urville's plant solely from the excellent plate quoted above.

The other species referable to *Lophoschœnus* are:

1. L. ARUNDINACEUS, *Stapf.* Syn.: *Schœnus arundinaceus*, Forster, Prodr. 89 (nomen; 1786); Vahl, Enum. ii. (1806) 220; C. B. Clarke, Ill. Cyp. (1909) t. 79. figs. 1–4; Guillaumin in Ann. Mus. Col. Marseille, xix. (2nd ser. ix. 1911) 258. *Asterochæta arundinacea*, Kunth, Enum. ii. 312, in part (1837). *Chætospora arundinacea*, Dietr. Spec. Pl. i. (1839) 183. *Carpha arundinacea*, Boeck. in Linnæa, xxxviii. (1874) 271. *Cyclocampe arundinacea*, Benth. in Benth. & Hook. f., Gen. Plant. iii. (1883) 1063, in part (?).

New Caledonia: without locality, **Forster*!; *Deplanche*, 240!; Canala, *Thiebaut*, 268; Thio, *Grunow*; on the mountains near Ngaye, 800′, *Schlechter* 15,169!; Bourail, *Pamel*, 147; on the mountains near Paita, 1000′, *Schlechter*, 14,957!; on the mountains near Yaouhé, 2000′, *Schlechter*, 14,765!; Bay of Prony, *Balansa*, 698.

2. L. COMOSUS, *Stapf.* Syn.: *Cyclocampe arundinacea*, Benth. ex Hook. f. in Hook. Ic. Plant. t. 1434 (1883). *Schœnus comosus*, C. B. Clarke in Kew Bull. Add. ser. VIII. (1908) 44, Illustr. Cyp. (1909) † t. 78. fig. 8; Guillaumin in Ann. Mus. Col. Marseille, xix. (2nd ser. ix. 1911) 258.

* Balade ex Guillaumin.

† In the explanation of the plate this name is, by a printer's error, attributed to Poiret.

New Caledonia: without precise locality, *Grunow*; peninsula of Pum (Poume), *Deplanche*, 542! Ile des Pins, on stony ground, *Milne*, 173!

3. Lophoschœnus Hornei, *Stapf.* Syn.: *Asterochæta elongata*, Baker, Fl. Maur. (1877) 417, *non* Kunth. *Cladium* (?) *xipholepis*, Baker, l. c. 424. *Cyclocampe elongata*, Benth. in Benth. & Hook. f. Gen. Plant. iii. (1883) 1063, excl. syn. (nomen). *Schœnus Hornei*, C. B. Clarke in Dur. & Schinz, Consp. Fl. Afr. i. (1895) 657; Illustr. Cyp. (1909) t. 79. figs. 5–7.

Seychelles: Mahé, common on mountains, *Horne*, 626′; in dry rocky places on mountains, *Thomasset*, 171! *Wright*.

Rhynchospora Wallichii (Wallichiana), *Kunth, Enum.* ii. 289.

Tenom, 800′, in open clearings near the "Residency." Fl. Jan. 2775. Kaningau plain, 1000′, near the "Station." Fl. Jan. 2948.

Distrib. Borneo (Brunei, *Motley*, 308; Sarawak, *Beccari*, 1010; Dutch S.E. Borneo, near Martapura, *Motley*, 619). Tropics of the Old World.

Rhynchospora aurea, *Vahl, Enum.* ii. 229.

Tenom, 700′, in ditches along the bridle-path to Melalap. Fl. Jan. 2821.

Distrib. Borneo (Brunei, *Motley*, 310; Sarawak, *Beccari*, 118; near Kuching, 1924, *Haviland*; Dutch S.E. Borneo, in marshes at Kalangan, S. of Martapura, *Motley*, 1299). All warm countries.

Rhynchospora chinensis, *Boeck. in Linnæa*, xxxvii. (1873) 586, non *Nees & Meyen*; *E. G. Camus in Lecomte, Fl. Indo-Chine*, vii. 148.

R. glauca, var. *chinensis*, C. B. Clarke in Dur. & Schinz, Consp. Fl. Afr. i. 671.

Tambunan plain, 2000′, on sandy soil. Fl. Feb. 3000.

Distrib. Borneo (Brunei, *Motley*, 378; Dutch S.E. Borneo at Padung Pulananan (near Martapura), *Motley*, 184). Seashores from Ceylon to South China and Borneo; according to C. B. Clarke also in Madagascar and the Sandwich Islands, whilst Camus adds Japan to the area.

Gahnia tristis, *Nees in Linnæa*, ix. (1834) 301 (nomen), *and in Hook. & Arn. Bot. Beechey's Voy.* 228.

Tuaran, 500′, on open sandstone hills near Kindu. Fl. March. 4344.

Distrib. Malayan region to China.

*Gahnia javanica, *Moritzi, Verz. Zoll. Pfl.* 98.

Kinabalu, 7000′, Kamburangau, in an open shallow sand-pan. Fl. Feb. 4160.

Distrib. Borneo (B. N. B. Kinabalu, 8000′, *Whitehead* (Herb. Brit. Mus.)). Malay Archipelago to Fiji in the East and Penang in the West.

Scleria lithosperma, *Sw. Prod. Veg. Ind. Occ.* 18.

Tenom, 900′, in sec. forest. Fl. Jan. 2689.

Distrib. Borneo (B. N. B. Kudat, *Fraser*, 1105). Throughout the tropics, excepting Continental Africa.

Scleria hebecarpa, *Nees in Linnæa*, ix. (1834) 303 (nomen *hebecarpha* sphalm.), *and in Wight, Contr.* 117.

Tenom, 800′, in open clearings near the "Residency." Fl. Feb. 2774.

Distrib. Borneo (Dutch S.E. Borneo, Kalangan, common, *Motley*). Indo-Malayan region to Australia and Polynesia.

Scleria purpureo-vaginata, *Boeck. in Engl. Bot. Jahrb.* v. (1884) 513.

Tenom, 700–2000′, throughout the country in sec. forest. Fl. Fr. Jan. 2665.

Distrib. Philippines.

"The colour of the inflorescence varies from light brown to blackish-brown and claret."

Scleria bancana, *Miq. Fl. Ind. Bat. Suppl.* 602.

Kaningau plain, 1000′, in "Lalang." Fl. Jan. 2978.

Distrib. Malayan region from Borneo westwards to the Malay Peninsula and Tonkin.

Carex rara, *Boott, Trans. Linn. Soc.* xx. (1846) 139 ; *Stapf in Trans. Linn. Soc.* ser. 2, *Bot.* iv. (1894) 246.

Kinabalu, summit 13,300′, cracks in granite. Fl. Feb. 4196.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*). East Himalaya, Khasia Hills, Ceylon, Philippines.

*Carex cruciata, *Wahlenb. in Vet. Akad. Nya Handl. Stockh.* (1803), 419.

Kinabalu, Penibukan spur, 5000′, between Dahobang and Kinitaki rivers, in high forest. Fl. Feb. 4093.

Distrib. Indo-Malayan region and Madagascar.

*Carex filicina, *Nees in Wight, Contr.* 123.

Kinabalu, Gurulau spur, 5000′, in high forest. Fl. Feb. 4004.

Distrib. Indo-Malayan region and throughout the Himalaya.

Carex saturata, *C. B. Clarke in Journ. Linn. Soc., Bot.* xxxvii. (1904) 12.

C. filicina, Stapf, l. c. 246, *non* Nees. *C. filicina*, var. *saturata*, Kükenth. in Engl. Pflanzenr. iv. 20. p. 275.

Kinabalu, above Pakapaka, 10,000–11,000′, in low forest. Fl. Feb. 4193.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*, 1402). According to Kükenthal his *C. filicina*, var. *saturata* also occurs on some of the high mountains of Sumatra and Java. I have not seen any specimens outside Kinabalu, nor had C. B. Clarke.

CAREX HYPSOPHILA, *Miq. Fl. Ind. Bat.* iii. 354 ; *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 246 ; *Kükenth. in Engl. Pflenzenr.* iv. 20. p. 546 (incl. var.) ; *C. B. Clarke in Journ. Linn. Soc., Bot.* xxxvii. (1904) 13.

Kinabalu, Kambarangau, 7000′, in damp places under *Leptospermum*. Fl. Feb. 4230. Above Kambarangau, 7000–8000′, on mossy tree-trunks. 4243. Above Pakapaka, in low forest, 10,000–11,000′, 4194; summit, 13,300′, in cracks of granite, 4191.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*, 1403). High mountains of the Malay Archipelago.

The specimens vary greatly in the length and width of the leaves and also in the density of the panicles. No. 4230 approaches nearest to the form collected by Haviland and described as *C. Havilandii* by C. B. Clarke, but like No. 4243, which has still narrower leaves, it is clearly a form conditioned by the nature of the station, both having grown up in damp places. No. 4191 from the exposed summit is stunted, and the leaves are shorter and more rigid, whilst the Pakapaka specimen is intermediate. The specimens at Kew from Java and Sumatra agree very well with Nos. 4191 and 4194 except in so far as the utricles are less scabrid.

CAREX BORNEENSIS, *C. B. Clarke in Journ. Linn. Soc., Bot.* xxxvii. (1904) 14. *C. fusiformis*, Stapf in Trans. Linn. Soc. ser. 2. Bot. iv. (1894) 246, *non* Nees. *C. fusiformis* v. *borneensis*, Kükenth. l. c. 598.

Kinabalu, Penibukan spur, 4000′, in high forest. Fl. Feb. 4070; Marai-parai spur, 7000′, in mossy forest. Fl. Feb. 4097.

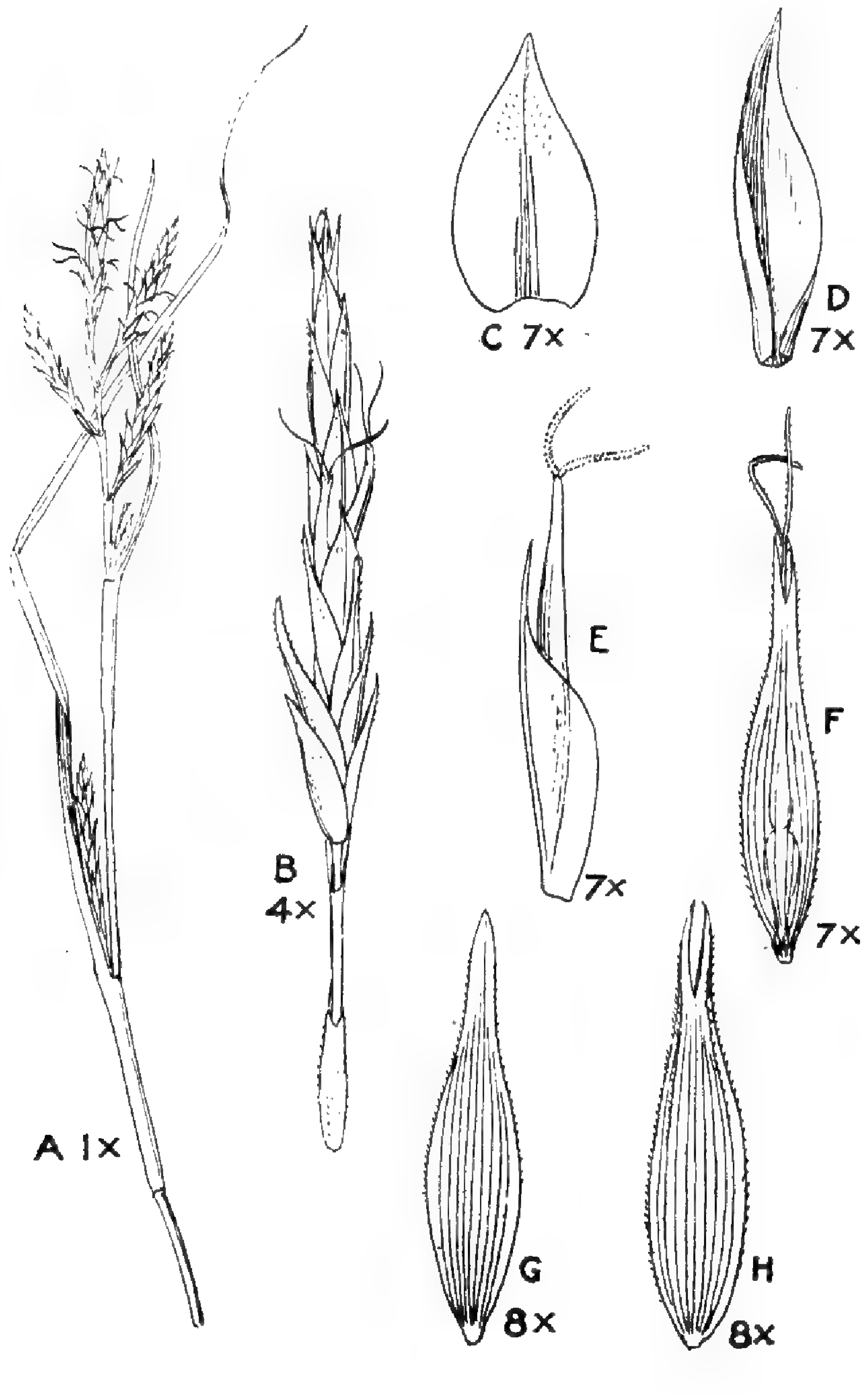
Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*).

*CAREX KINABALUENSIS, *Stapf*, sp. nov. ; arcte affinis *C. brunneæ*, Thunb., a qua foliis latioribus viridioribus præter margines utrinque lævibus, spiculis breviter pedunculatis, utriculis angustioribus sensim in rostrum abeuntibus præter margines fere lævibus, stigmatibus brevibus distincta.

Cæspites rhizomati brevi insidentes. *Culmus* gracilis, triqueter, supra basin folia 3–4 dissita gerens, circa 50 cm. altus, lævissimus, ima basi cataphyllis fuscis nitidis obtectus. *Folia* culmum superantia ; vaginæ intermediorum triquetræ, 4–5 cm. longæ, ad angulos vix scaberulæ; laminæ virides planæ lineares superne longissime tenuiter attenuatæ, ad 60 cm. longæ, ad 5·5 mm. latæ, in margines et apicem versus in costa asperæ, cæterum læves vel lævissimæ, costa subtus tenui prominula. *Spiculæ* 4–5 apice approximatæ, paucæ e foliorum summorum axillis remotis additæ, breviter pedunculatæ, cylindricæ, 1·5–2 cm. longæ, androgynæ, parte ♂ paulo breviore quam ♀ ; bracteæ summæ

e vagina brevi breviter setaceæ, cæteræ foliaceæ, intermediæ lamina angustissima (inflorescentiam superantes ; cladoprophylla pedunculi basin anguste cingentia, ad 4 mm. longa. *Glumæ* ♀ ovatæ, acutæ vel breviter mucronulatæ, 3·5 mm. longæ, pallide bruneæ, haud viridi-carinatæ, superne sub

Fig. 7.



Carex kinabaluensis. A. Inflorescence ; B. Spike with cladoprophyllum ; C. Lower glume (♀); D. Upper glume (♂) ; E. Glume with floret; F. Floret; G. Back half of utricle ; H. Front half of utricle.

caule tenuissime scaberulæ. *Glumæ* ♂ similes, sed acuminatæ. *Utriculi* post anthesin lanceolatæ, basi breviter cuneatæ, in rostrum sensim attenuatæ,

5 mm. longæ, membranacei, ad margines scaberuli, cæterum fere læves, ore valde obliquo. *Stylus* basin versus incrassatus, ad insertionem constrictus. *Stigmata* 2 vix 2 mm. longa ignota.

Hab. Kinabalu, below Pakapaka cave, 9000′, under trees. Fl. Feb. 4240.

Undoubtedly an ally of *C. brunnea.*

GRAMINEÆ. (O. Stapf.)

Paspalum conjugatum, *Berg. in Act. Helvet.* vii. (1772) 129, t. 8.

Tenom, 700′, in Chinese gardens. Fl. Fr. Jan. 2630. Bridle-path between Tenom and Melalap, 1000′, in open "Lalang." 2862. Melalap, 800′, on sandbanks in Pengallan river. 2754.

Distrib. Borneo (B. N. B. Kudat, *Fraser*; Labuan, *Motley*, 18; Sarawak, *Beccari*, 869, 3294). Tropics of both hemispheres.

Paspalum Kora, *Willd. Spec. Pl.* i. 332.

Tenom, 800′, in clearings near the Residency. Fl. Jan. 2773.

Distrib. Borneo (B. N. B. East Coast, *Creagh*; Labuan, *Motley*, 43; Sarawak, *Beccari*, 110). Tropics of the Old World.

*Isachne albens, *Trin. Sp. Gram. Ic.* t. 85.

Kinabalu, above Lobang, 6000′, undergrowth in high forest. Fl. Feb. 4113.

Distrib. Malaya, India, S. China.

*Isachne virgata, *Nees, ex Steud. Syn. Pl. Gram.* 96, in syn.

Kinabalu, Maraiparai spur, 5000′, on open serpentine. Fl. Feb. 4069.

Distrib. Mountains of Java and Sumatra.

Isachne rigida, *Nees, ex Steud. Syn. Pl. Gram.* 95.

Tenom, 700′, in a ditch on the bridle-path to Melalap. Fl. Feb. 2583.

Distrib. Malayan region.

Panicum colonum, *Linn. Syst.* ed. 10, 870.

Melalap, 800′, clearings and paths on the estate. Fl. Jan. 2726.

Distrib. Borneo (B.N.B. Kudat, *Fraser*; Labuan, common, much liked by cattle, *Motley*, 50; Sarawak, *Beccari*, 3109; near Kuching, *Haviland*, 1920; Borneo, near Martapura, *Motley*, 126). All warm countries.

Panicum nodosum, *Kunth, Enum. Pl.* i. 97.

Tenom, 700′, on the bridle-path to Melalap, in shade. Fl. Jan. 2673.

Distrib. Borneo (Sarawak, near Kuching, *Haviland*, 1930). Assam to Malacca and eastward throughout the Malay Archipelago and the Philippines; also in Ceylon and Travancore.

PANICUM SARMENTOSUM, *Roxb. Hort. Beng.* 8.

Tenom, 700–1000′, in open clearings and under trees, common everywhere. Fl. Fr. Jan. 2743, 2678 *bis*.

Distrib. Borneo (Labuan, in bushy places scrambling among tall plants at Kapala Punga, *Motley*, 337). Malay Peninsula to Assam, Philippines, South China.

PANICUM PATENS, *Linn. Sp. Pl.* ed. 2, 86.

Tenom, 700–1000′, common everywhere in open clearings and under trees. Fl. Fr. Jan. 2668.

Distrib. Borneo (Labuan, *Motley*, 47–93 ; Sarawak, *Beccari*, 3814, 3816 ; D. Borneo, shady places near Pengaran, *Motley*, 12 ; Martapura, *Motley*, 171. Gunong Yabok, *Motley*, 208). Tropical Asia and Pacific Islands.

DIGITARIA LONGIFLORA, *Pers. Syn.* 85.

Tenom, 700′, on the bridle-path, general in the open. Fl. Jan. 2677.

Distrib. Borneo (Labuan, *Motley*, 17, 24 ; D. Borneo, Martapura, *Motley*, 114, 118, 155, 157, 792). Tropical and subtropical regions of the Old World.

DIGITARIA PRURIENS, *Buese in Miq. Pl. Jungh.* 379.

Tenom, 900′, in open "Lalang," common everywhere. Fl. Jan. 2687.

Distrib. Borneo (D. Borneo, Gunong Konygiau, *Motley*, 122; Martapura, *Motley*, 172, 175, 435). Malay Archipelago.

OPLISMENUS COMPOSITUS, *Beauv. Agrost.* 54, f. *velutina*.

Melalap, 800′, on open "rentis." Fl. Jan. 2728.

Distrib. Borneo (Labuan, extensively creeping about near Sanjong Kubong, *Motley* ; Borneo, shady places near Pengaron, *Motley*, 151, 439).

SETARIA PALMIFOLIA, *Stapf*, comb. nov. *Panicum palmæfolium*, Kœnig in Naturf. xxiii. (1788) 208.

Tenom, 700′, near "campong," under fruit-trees by the river. Fl. Jan. 2650.

Distrib. Borneo (Sarawak, *Beccari*, 1019). Tropical Asia.

"Creeping rhizome, aerial shoots 1·25 m. in height."

CENCHRUS VIRIDIS, *Spreng. Syst.* i. 301.

Melalap estate, 800′, in open clearings. Fr. Jan. 2742.

Distrib. Borneo (B. N. B. East Coast, *Creagh*; Labuk Bay, Limbarra Island, *Ridley*, 9040). Tropical America ; Malaya from Siam to the Kei Islands and the Philippines.

COIX LACRYMA-JOBI, *Linn. Sp. Pl.* 972.

Tenom, 700′, on a sandbank in the stream, by the railway track to Melalap. Fr. Fl. 2843.

Distrib. Borneo (D. Borneo, only the cultivated variety "Mayuen," Pengaron, *Motley*, 1117). Motley says it is used for making a certain kind of cakes, not as a staple article of food. In the north of Borneo it is used by the Dyaks to brew a kind of beer. The native name is "Jali batu," *i. e.* Stone Sorghum.

ORYZA MINUTA, *Presl, Rel. Hænk.* i. 208.

Tenom, 700′, along the railway track to Melalap, in open "Lalang." Fr. Jan. 2854.

Distrib. Borneo (Sarawak, *Beccari*, 1020). India and Malaya to the Philippines.

ORYZA RIDLEYI, *Hook. f. Fl. Brit. Ind.* vii. 93.

Tenom, 700′, undergrowth in old gardens and sec. forest. Fr. Jan. 2642.

Distrib. Borneo (D. Borneo, near Pengaron in very wet thickets, *Motley*, 437).

ORYZA MEYERIANA, *Baill. Hist. Pl.* xii. 166.

O. granulata, Nees et Arn. (nomen) ; Hook. Fl. Brit. Ind. vii. 93.

Tenom, foothills, 900′, undergrowth in sec. forest. Fr. Jan. 2692.

Distrib. Indo-Malayan region.

"Stiff, bamboo-like in habit, creeping in tufts. 50 m. high."

MISCANTHUS SINENSIS, *Anderss. in Œfvers. Vet.-Akad. Stockh.* (1855) 166.

Sarawak, on Matung, 1000–2000′, common also in B. N. Borneo. Fl. March. 4415.

Distrib. Borneo (B. N. B. Kinabalu, 5000′, *Low*; Gaya Island, *Ridley*, 9102; Sarawak, *Beccari*, 1020). Malay Archipelago to China and Japan.

ROTTBOELLIA GLANDULOSA, *Trin. in Mém. Acad. Pétersb.* sér. 6, ii. (1833) 250.

Tenom, foothills, 900′, in sec. forest undergrowth. Fl. Jan. 2702.

Distrib. Borneo (Labuan, common in bushy places, 7–8 feet high, *Motley*, 336; Sarawak, *Beccari*, 518, 3741. S. Borneo, near Martapura, *Motley*, 80).

ISCHÆMUM RUGOSUM, *Salisb. Ic. Stirp. Rar.* i. t. 1.

Tenom, 800′, in open clearings near the Residency. Fl. Jan. 2783.

Distrib. Borneo, Indo-Malayan region.

ANDROPOGON BREVIFOLIUS, *Sw. Prodr. Veg. Ind. Occ.* 26.

Tenom, 800′, in open clearings by the Residency. Fl. Fr. Jan. 2678.

Distrib. Borneo (D. Borneo, Gunong Mengualon, *Motley*, 22). Tropics generally.

SORGHUM SERRATUM, *Stapf*, comb. nov.

Andropogon serratus, Thunb. Fl. Jap. 41.

Usakan, 300′, amongst "Lalang," on open sandstone crest. Fr. March. 4321.

Distrib. Borneo (B. N. B., *Burbidge*). Tropics of the Old World.

THEMEDA GIGANTEA, subsp. INTERMEDIA, var. DUBIA, *Hack. in DC. Monog. Phan.* vi. 675.

Tenom, foothills, 900′, in small patches in sec. forest. Fl. Fr. 2703.

Distrib. Borneo (Sarawak, *Beccari*, 934).

—— subsp. ARUNDINACEA, *Hack.* North Borneo, Masudu Bay, *Fraser*, 264.

—— subsp. CAUDATA, *Hack.* Labuan, *Motley*, 303.

General distribution of the species in Hackel's sense: Indo-Malayan region to S. China and Australia.

"A handsome grass, 3 m. in height; also in old 'Lalang' and along river."

DESCHAMPSIA FLEXUOSA, *Trin.*, var. LIGULATA, *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 248.

Kinabalu, Pakapaka to granite core, 10,000–12,000, in open spaces and under scrub. Fl. Fr. 4192. Granite core to summit, 12,000–13,000′, cracks in granite, abundant. Fl. Feb. 4185.

Distrib. (of var.). Borneo (B. N. B. Kinabalu, 13,000′, *Haviland*) ; (of species) Europe and N. America, Falkland Islands and Magellan Strait.

ELEUSINE INDICA, *Gaertn. Fruct.* i. 8.

Melalap estate, 800′, everywhere in clearings and gardens. Fl. Fr. Jan. 2727.

Distrib. Borneo (B. N. B. Kudat, *Fraser*, 117 ; East Coast, *Creagh* ; Sarawak, *Beccari*, 3313; Rejang, *Haviland*, 3136; D. Borneo, Poentianah, *Teysmann*, 11,593). Warm regions of the Old World.

LEPTOCHLOA CHINENSIS, *Nees in Syll. Ratisb.* i. (1824) 4.

Melalap, 800′, everywhere in open clearings. Fl. Jan. 2736.

Distrib. Borneo (D. Borneo, wet banks of the Kiam river, *Motley*, 136).

ERAGROSTIS AMABILIS, *Wight & Arn., ex Nees in Hook. & Arn. Bot. Beechey's Voy.* 251.

Melalap, 800′, sandbank in Pengallan river. Fl. Jan. 2750.

Distrib. Borneo (B. N. B. Kudat, *Fraser*, 195 ; Port Myburgh, *Creagh* : Labuan, *Motley*, 68; Sarawak, Kuching, *Haviland*, 1925; D. Borneo, Sungei Paring, *Motley*, 132). Tropical Asia.

ERAGROSTIS PLUMOSA, *Link*, *Hort. Berol.* i. 192.

Melalap estate, 800′, in open clearings. Fl. Fr. Jan. 2756.

Distrib. Borneo (B. N. B., *Burbidge*; Labuan, *Motley*, 81; D. Borneo, waste ground near Bangemapura, *Motley*, 116). Warm parts of both hemispheres.

CENTOTHECA LAPPACEA, *Desv. in Nouv. Bull. Soc. Philom.* ii. (1810) 189.
Tenom, 700′, under fruit-trees. Fl. Jan. 2648.
Distrib. Borneo (B. N. B. East Coast, *Creagh*; Labuan, *Motley*, 174; Sarawak, *Beccari*, 122: Penkulu Ampat, *Haviland*, 441; D. Borneo, Martapura, *Motley*, 301). Tropics of the Old World.

*LOPHATHERUM GRACILE, *Brongn. in Duperr. Voy. Bot.* 50, t. 3.
Kinabalu, Gurulau spur, 5000′, in high forest, on the ridge. Fl. Feb. 4005.
Distrib. Borneo (Labuan, *Motley*; D. Borneo, Martapura, *Motley*, 18).

POA EPILEUCA, *Stapf in Hook. Ic. Pl.* sub t. 2607.
Deyeuxia epileuca, Stapf in Trans. Linn. Soc. ser. 2. Bot. iv. (1894) 247, pl. 20 c. 10–16.
Kinabalu, summit, 13,000′, cracks in granite. Fl. Feb. 4352.
Distrib. Borneo (B. N. B. Kinabalu, 10,000′, *Haviland*).

*BAMBUSA (?) GIBBSIÆ, *Stapf*, sp. nov.; si vere *Bambusæ* adnumeranda, habitu scandente, cataphyllis tenuiter coriaceis, spiculis habitu *Arundinariæ* distincta.

Frutex in arboribus scandens, ramis tenuiter fistulosis lævissimis, ramulis semiverticillatis 4–12-nis gracilibus patulis vel patulo-erectis, 3–9–12-nodis florendi tempore laminas 6–8 gerentibus. *Cataphylla* turionum vetusta explanata, oblonga, sursum sensim attenuata, exauriculata, tenuiter coriacea, ut videtur, extra glabra, intra nitentia, unum visum 15 cm. longum, 4 cm. latum. *Foliorum* vaginæ arctissimæ, læves, glabræ vel superne versus margines puberulæ, earum ora 10–12 mm. distantia breviter obtuse auriculata ciliis persistentibus 4–5 mm. longis munita; ligulæ brevissimæ, fere obscuræ; laminæ lineares, longe attenuatæ, subsetaceo-acuminatæ, basi breviter contractæ, sessiles, ramorum sterilium circiter 10 cm., fertilium 4–6 cm. longæ, 3·5–4 mm. latæ, glaberrimæ, læves, nervis tenuibus arctis, venis transversis conspicuis nullis. *Spiculæ* vel in ramulorum foliigerorum apicibus racemosæ vel in ramis ut videtur specialibus 50 cm. excedentibus efoliatis ad nodos fasciculatæ, fasciculis 2·5–3·5 cm. longis; pedunculi breves vel brevissimi. *Glumæ* plerumquæ duæ, ovato-lanceolatæ, acuminatæ, glabræ vel magis minusve ciliatæ, inferior brevior 3–5-nervis, superior 7–8 mm. longa, 7-nervis. *Anthœcia* plerumque 4 quorum summum imperfectum, dissita, rhachillæ articulis a dorso compressis. *Valvæ* a latere visæ lanceolatæ,

acute acuminatæ, 10 mm. longæ, 7–9-nerves, nervis prominulis, ad margines puberulæ. *Paleæ* valvas subæquantes, superne et in dorso puberulæ et in carinis apicem versus asperæ. *Lodiculæ* 3, apice ciliatæ. *Stamina* 6; filamenta tenuissima, 6 mm. longa; antheræ lineares, apice basique minute bilobæ, exapiculatæ, 5 mm. longæ. *Ovarium* stipitatum, subglobosum, supra medium pilis rigidis vestitum; stylus fere ad basin 3-fidus, ramis basi rigide ciliatis. Fructus ignotus.

Hab. Kinabalu, Maraiparai spur, 5500–8000′, in mossy forest, 4091; Kamburangau, 7500–9000′, in mossy forest, 4232. Forming thick undergrowth and scrambling over trees.

I should have referred this bamboo to *Arundinaria* if it were not for the 6-merous andrœcium and the shape and structure of the pistil. At the same time I am not satisfied with its position in *Bambusa*, where it occupies an isolated position on account of its slender rambling growth, the comparatively delicate cataphylls, and the texture of the valves.

GIGANTOCHLOA HETEROCLADA, *Stapf*, sp. nov.; affinis *G. Scribnerianæ*, Merrill, sed caulibus heteromorphis, *i. e.* aliis foliiferis, aliis florentibus, spiculis dorso rotundatis glumis valvisque haud ciliatis, antheris brevioribus distincta.

Frutex 10 m. altus, heterocladus, caules steriles foliatos et unum (semper?) florentem efoliatum eadem altitudine emittens. *Folia caulium juvenilium* sterilium vel turionum germinantium: vaginæ ad 15 cm. longæ, teretes, ad ora subabrupte truncatæ, nervoso-striatæ, parce strigillosæ pilis adpressis, mox glabrescentes, ad margines eciliatæ, ad ora (saltem inferiora) fimbriatæ, fimbriis tenuibus ad 5 mm. longis evanescentibus; ligulæ exteriores interioresque brevissimæ, truncatæ, scariosæ, interiores ciliatæ ciliis mox evanidis; laminæ lineares, sursum longe tenuiter attenuatæ, apice acutissimæ, ad 12 cm. longæ, 10–12 mm. latæ, utrinque parce pilosæ vel glabrescentes, arcte nervoso-striatæ, venulis oblique transversis nonnullis, in margine minute serrulato-scabræ. *Folia ramorum adultorum*: vaginæ compressæ, acute carinatæ, glabræ, nisi interdum ad carinam pubescentes, ad ora abrupte truncatæ et cum ligulis angulum acutum vel rectum formantes, tenuiter multistriatæ; ligulæ exteriores interioresque brevissimæ, truncatæ, primo saltem ciliolatæ; laminæ lanceolato-lineares, basi breviter subcuneatim attenuatæ, apice acuminatæ, ad 28 cm. longæ, ad 5 cm. latæ, exsiccatæ concolores, pallide virides, supra glabræ, subtus basi ad costam molliter pilosæ, præterea parce tenuiterque pilosulæ, nervis primariis utrinque circiter 4, secundariis obscuris circiter 8 interjectis, venis transversis admodum obscuris, margine uno aspero vel asperulo altero lævi vel sublævi; petiolus 5–6 mm. longus, utrinque pilosus. *Rami* inflorescentiæ giganteæ, glabræ, late cavi, parietibus tenuibus, ultimis ordinis fusco-puberuli. *Spiculæ* glomeratæ,

glomerulis densissimis globosis 3 vel interdum ad 4 cm. diametro 4 cm. distantibus, ovato-lanceolatæ, acutæ, in dorso rotundatæ, 10–12 mm. longæ, fusco-stramineæ, 2–3-floræ. *Glumæ* steriles 3, sensim in valvas vel glumas florentes abeuntes et sursum accrescentes, late ovatæ, mucronulatæ dense pubescentes, eciliatæ, summa (tertia) 5–6 mm. longa, utrinque nervis circiter 10. *Valvæ* consimiles, ad 10 mm. longæ, crebrius nervosæ. *Paleæ* lineari-oblanceolatæ, in carinis scabridæ, quam valvæ paulo breviores. *Stamina* 6; filamenta ultra 3/4 in tubum longum connatum; antheræ 5–6 mm. longæ, apiculatæ. *Ovarium* apice pubescens; stylus indivisus, puberulus.

Mensangau, 2200′, undergrowth in sec. forest. Fl. Feb. 3039. "A handsome clump, 10 m. high, with one immense branched flowering stem about the same height." Tenom, 700′, undergrowth in sec. forest; sterile. 2928.

Distrib. Endemic in N. Borneo.

A very striking plant on account of the gigantic, leafless flowering stems which rise from among the leafy clumps.

SCHIZOSTACHYUM ZOLLINGERI, *Steud. Syn. Gram.* 332.

Hills above Tenom, 2000′, in primary high forest. Fl. Jan. 2888. Kaningau plain, by the Station, 1000′, forming groves by "campongs." Fl. Jan. 2967.

Distrib. Borneo (Sarawak, Saribas, *Haviland*, 1582). Malay Archipelago.

DINOCHLOA sp.

Tenom, 700′, railway track to Melalap, undergrowth in sec. forest. Jan. 2831.

GYMNOSPERMÆ.

GNETACEÆ.

GNETUM LATIFOLIUM, *Blume in Hoev. & De Vriese, Tijdschr.* i. (1834) 161.

Tenom, 700–1000′, sec. forest, ♂ ♀. Fr. Jan. 2798.

Distrib. Borneo (B. N. B. Liamil Island, *Creagh*; Sarawak). Java, Sumatra, Celebes, and Philippines.

TAXACEÆ. (O. STAPF.)

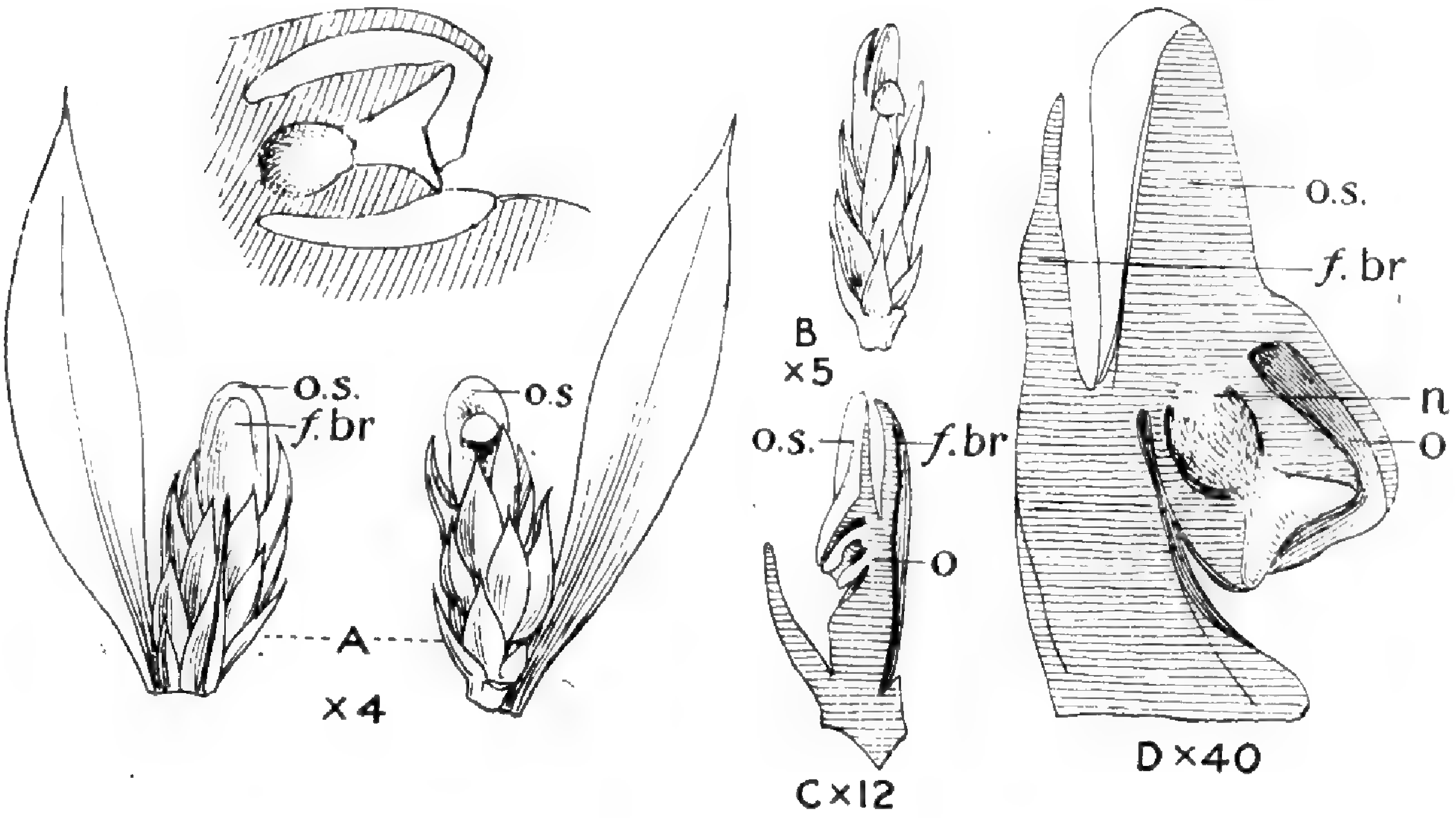
*DACRYDIUM FALCIFORME, *Pilg. in Engl. Pflanzenr.* (Tax.) 45, f. 4. D–G. (Text-fig. 8.)

Kinabalu, Maraiparai spur, 6000–8000′, Dapatan and Penibukan ridges, 5000′, tree, 10 m., in high and mossy forest. ♂ (young). Feb. 4067.

Sarawak, Matang, 3000′, small tree, 7 m., on the forest ridge. ♂. March. 4400.

Distrib. Borneo (Sarawak); Philippines.

Fig. 8.



Dacrydium falciforme. A. Back and front view of strobilus; B. Young strobilus; C. Strobilus in longitudinal section; D. Ovule with ovuliferous scale and fertile bract in longitudinal section. *f.br.*, fertile bract; *o.s.*, ovuliferous scale; *o.*, ovule; *n.*, nucleus.

Here also belong :—A specimen of Haviland's from the top of Santubong, at 2800′, one of Lobb's from "Borneo," and one from Mt. Halcon, Mindoro, by E. D. Merrill, No. 5744. Lobb's specimen possesses good ♀ flowers.

Figures H–L on p. 47 of Pilger's Monograph, quoted above, belong to *D. taxoides* and not, as would appear from the description of the illustration, to *D. falciforme*. They are, as stated, copied from Brongniart and Gris.

Dacrydium Gibbsiæ, *Stapf*, sp. nov.; affine videtur *D. Beccarii*, speciei imperfecte notæ, sed foliis heteromorphis brevioribus sectione trigonis (haud tetragonis) distinctum. (Pl. **4**.)

Arbor 2–20 m. alta, juvenilis ramulis pendulis, matura erectis crassiusculis cum foliis squarrosis 8–9 mm. diametro. *Folia* status juvenilis laxiuscula, acicularia, leviter incurvata, pungentia, 12–14 mm. longa, vix 1 mm. lata, facie plana, dorso carinata, juxta carinam utrinque sulcata; folia status adulti dense imbricata, leviter incurvata, acicularia, pungentia, 6–7 mm. longa, vix 1 mm. lata, facie plana, dorso leviter carinata, juxta carinam utrinque subsulcata. *Strobili* masculi ignoti. *Strobili* feminei terminales, parvi, sub

anthesi e foliis summis breviter exsertis, e bracteis 20 (vel ultra) sterilibus foliis consimilibus nisi basin versus descrescentibus et 3–1 fertilibus constituti; bracteæ fertiles (carpidia) aciculares, acutæ, ad 7 mm. longæ, facie basin versus concavæ et supra ipsam squamam ovuligeram solitariam gerentes. *Squama ovulifera* vel *epimatium* fere ad basin liberum, sub anthesi cucullatum, apice minute apiculatum vel crista brevissima munitum ore lato basiscopo, exsiccatum longitudinaliter striatum. *Ovulum* sub anthesi præter micropylam mammiformem vix epimatio exsertum. *Strobili* maturi e foliis summis distincte exserti, a ramulo facile soluti, ad 1 cm. longi. *Semina* erecta vel oblique erecta, bracteas summas steriles vix vel paulo superantia, ovoidea, 4 mm. longa, brunnea, nitida, basi ad $\frac{1}{4}$–$\frac{1}{3}$ epimatio aucto incrassato cupuliformi cincta.—*D. Gibbsiæ*, Stapf ex Gibbs in Ann. Bot. vol. xxvi. p. 525 (name only). *D.* sp. n., Stapf in Trans. Linn. Soc. ser. 2. Bot. iv. (1894) 248.

Hab. Kinabalu, in forest or scrub on the spur above Lobang up to the granite core, 6000–12,000′. ♀. Feb. 4162. Collected already by Low on Kinabalu, between 8000′ and 11,000′; but only in the juvenile state.

Endemic.

Twice I found normal seeds supported by what appeared to be an organ intermediate between an ovuliferous scale or epimatium and a fertile bract. In one case the seed so supported (Pl. **4**. fig. F) occurred in an almost mature 2-seeded strobilus (Pl. **4**. fig. D), the other seed of the pair (Pl. **4**. figs. E, G–I) being accompanied by a normal epimatium and a fertile bract. The second case concerned a one-seeded mature strobilus (Pl. **4**. figs. J–P). In both the organ tapered from a broad, more or less ovate and concave base to a subulate point and was keeled like an ordinary bract. The base was, however, not wide enough to embrace more than a third or a half of the base of the seed. In one of them (Pl. **4**. figs. K, M, N) it showed transverse wrinkles on one side like those of the normal mature epimatium (Pl. **4**. fig. G). The most plausible explanation of this condition seems to be that those seeds were truly terminal and therefore destitute of the supporting bract.

Podocarpus imbricatus, *Blume, Enum. Pl. Jav.* 89; *Pilg. in Engl. Pflanzenr.* iv. 5 (Tax.) 56.

P. cupressina, R. Br. ex Mirb. in Mém. Mus. xiii. 75 (nomen); Bennett in R. Br. Pl. Jav. Rar. i. 35, t. 10; Stapf in Trans. Linn. Soc. ser. 2. Bot. iv. (1894) 249.

Kinabalu, spur above Lobang to the granite core, 6000–12,000′. ♂ ♀. Feb. 4166. Also on the Maraiparai spur from 5000–7000′.

Distrib. Borneo (B. N. B. Kinabalu, 11,000′, *Haviland*; Sarawak). North Burma, Sumatra, Celebes, Philippines, and Fiji.

"A tree 20 m. in height, abundant on the slopes in the high forest above Lobang and through the succeeding mossy forest; this species is also prominent on the exposed ridges, being dwarfed to 2 m. in the sub-summit

dwarf forest. On the Maraiparai spur it occurs in the open at 5000′ in dwarf form, and in the succeeding mossy forest from 6000–7000′ in its forest form."

PODOCARPUS BREVIFOLIUS, *Foxw. in Philipp. Journ. Sci., Bot.* vi. (1911) 160, pl. 29.

Kinabalu spur, above Lobang to the granite core, 6000–12,000′. ♂. Feb. 4166. Also on the Maraiparai spur, 4000–5000′.

Distrib. Borneo (B. N. B. Kinabalu, 11,000–12,000′, *Low*, *Haviland*). Philippines.

The plate quoted above is a reduced photograph, showing no details.

PODOCARPUS POLYSTACHYUS, *R. Br. ex Mirb. in Mém. Mus. d'Hist. Nat.* xiii. 75 (nomen) ; *Endl. Syn. Conif.* 215 ; *Pilg. in Engl. Pflanzenr.* iv. 5 (Tax.) 79.

Jesselton, near the harbour, abundant on sandstone cliffs, by the seashore. ♂ ♀. Dec. 2592.

Distrib. Borneo (B. N. B. Kudat, *Fraser* ; Labuan, *Motley* ; Sarawak ; D. Borneo). Malay Peninsula, Sumatra, Java, and Philippines.

This species is represented at Kew from the following localities in the Malay Archipelago and the Philippines :—Sumatra, Mt. Singalan, *Beccari*, 252 ; Borneo, Sarawak, *Beccari*, 591, 2213, 2513 ; British N. Borneo, Kudat, *Fraser*, 48 ; Labuan, a small tree growing on the seashore, *Motley*, 360 ; Dutch Borneo, Banjermassing, *Motley*, 604 ; Philippines, Island of Parague, *Vidal*, 391 ; Island of Palawan, *Foxworthy*, 904.

PODOCARPUS sp.

Kinabalu, Maraiparai spur, 5000–8000′, tree, 10–20 m. high, with the young foliage red, from the open ridge to the mossy forest. Veg. Feb. 4089.

The leaves are, in shape and size, intermediate between those of *P. brevifolius* and *P. polystachyus*, but thinner and much more loosely arranged than in either. There are no flowers or fruits with the specimen.

*PODOCARPUS sp.

Kinabalu, Maraiparai spur, 5000–8000′, tree, 7–10 m. high, common. Veg. Feb. 4092 ; and on the Penibukan ridge at 5000′, in mossy forest.

A very striking species with fairly crowded leaves, oblong-linear, obtuse or sub-obtuse at the apex, attenuated at the base, 1·5–2 cm. long, 3·5–4·5 mm. broad, with the margins recurved, the midrib raised above and rather broad and flat beneath. There are neither flowers nor fruits with the specimen.

Phyllocladus hypophylla, *Hook. f. in Hook. Ic. Plant.* t. 889 ; *Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 249 ; *Pilg. in Engl. Pflanzenr.* iv. 5 (Tax.) 99, excl. *Beccari's* no. 2391.

Kinabalu, Maraiparai spur, 7000′, tree, 17 m. high, in mossy forest. Veg. Feb. 4088. Above Lobang, 6000′, in mossy forest, tree, 10–17 m. ♀. 4152. Pakapaka cave, 10,000′, in small sheltered forest, tree, 10 m. ♀. 4238. Pakapaka cave to granite core, tree in sub-summit dwarf forest, with very glaucous foliage. ♂ ♀. 4273.

Distrib. Borneo (B. N. B. Kinabalu, 8000–10,000′, *Low* ; a shrub from 10,000–12,000′, *Haviland* ; Sarawak). New Guinea.

Also collected on Lobang Peak, N.E. Borneo, by Lobb. The amount of glaucous bloom on the leaves and young branches is extremely variable and does not constitute a character for the discrimination of varieties.

CYCADACEÆ.

Cycas circinalis, *Linn. Sp. Pl.* 1188.

Usakan Bay, on the rocky seashore. ♂ ♀. Fr. March. 4337.

Distrib. Java, Moluccas, Philippines and New Guinea ; India and Ceylon; tropical Africa and Madagascar ; Comoro Islands.

There is no specimen of this widely distributed species from Borneo at Kew or at the British Museum. Beccari (**18**. p. 224) mentions it as abundant on the Sundu river, in Sarawak, and Burbidge (**9**. p. 246) as common on Gaya Island. I found it growing singly on the rocky seashore, and abundantly in a small cove where the soil consisted entirely of coral debris which had accumulated behind a small mangrove association. The species also occurs in Labuan.

PTERIDOPHYTA.

FILICES. (A. Gepp.)

*Trichomanes proliferum, *Blume, Enum. Pl. Jav.* 224 (1828).

Kinabalu, Gurulau spur, 5000′, epiphytic on mossy tree-trunks. Feb. 4019.

Distrib. Tropical Asia.

*Trichomanes nitidulum, *van den Bosch in Plant. Junghuhn.* i. 547 (1856).

Kinabalu, above Lobang, 7000′, epiphytic in mossy forest. Feb. 4253.

Distrib. Borneo, Java, Riouw.

Trichomanes digitatum, *Sw. Syn. Fil.* 370, 422 (1806).

Kinabalu, below Pakapaka, 9000′, on the ground in mossy forest. Feb. 4233.

Distrib. Borneo (B. N. B., *Burbidge* ; Sarawak). Tropical Asia, New South Wales, Mascarene Islands.

Trichomanes pallidum, *Blume, Enum. Pl. Jav.* 225 (1828).

Kinabalu, between Lobang and Kamburangau, 6000–7000′, epiphytic in mossy forest. Feb. 4143.

Distrib. Borneo (B. N. B., *Burbidge* ; Sarawak). Tropical Asia, Polynesia.

*Trichomanes javanicum, *Blume, Enum. Pl. Jav.* 224 (1828).

Kinabalu, Maraiparai spur, 7000′, terrestrial in mossy forest. Feb. 3109.

Distrib. Borneo (B. N. B., *Burbidge* ; Sarawak ; D. Borneo) ; Sulu Islands. Tropical Asia ; Polynesia, Australia ; Liu-Kiu Islands.

Trichomanes rigidum, *Sw. Prodr.* 137 (1788).

Kinabalu, Penibukan ridge, 5500′, associated with *Bambusa Gibbsiæ*. Feb. 4081.

Distrib. Borneo (B. N. B. Kinabalu, 5000–7000′, *Burbidge* ; Sarawak ; D. Borneo) ; Sulu Islands. Tropics.

Trichomanes maximum, *Blume, Enum. Pl. Jav.* 228 (1828).

Kinabalu, Maraiparai spur, 6000–7000′, undergrowth in mossy forest, abundant and forming a well-marked zone. Feb. 4036.

Distrib. Borneo (B. N. B. Kinabalu, 5000–6000′, *Low*, *Burbidge*; Sarawak ; D. Borneo) ; Sulu Islands. Malay Islands, Polynesia, Queensland.

*Hymenophyllum blandum, *Racib. in Flor. Buitenz.* i. 20 (1898).

Kinabalu, above Kamburangau, 8000–9000′, epiphytic in mossy forest. Feb. 4228.

Distrib. Java.

*Hymenophyllum holochilum, *C. Chr. Ind. Fil.* 362.

Leptocionium holochilum, v. d. Bosch, Hymen. Jav. 44, t. 34 (1861).

Kinabalu, above Lobang, 7000′, epiphytic in mossy forest. Feb. 3112.

Distrib. Java.

*Hymenophyllum fraternum, *Harr. in Journ. Linn. Soc., Bot.* xvi. (1878) 26.

Kinabalu, Maraiparai spur, 6000′. Feb. 4071.

Distrib. Philippine Islands.

Hymenophyllum Neesii, *Hook. Spec. Fil.* i. 99 (1846).

Kinabalu, from above Lobang to Pakapaka, 7000–10,000′, in mossy forest, epiphytic. Feb. 4144. Near Bundu Tuhan, 2000′, epiphytic in sec. forest. Feb. 3962.

Distrib. Borneo (B. N. B., *Low, Burbidge* ; Sarawak). Malay Islands ; Ceylon.

*Hymenophyllum aculeatum, *Racib. in Flor. Buitenz.* i. 21 (1898), in part ; *v. Alderw. v. Rosenb. Malayan Ferns,* 82 (1908).

Kinabalu, Gurulau spur, 5000′, epiphytic on mossy tree-trunks. Feb. 4020.

Distrib. Malay Islands ; Ceylon.

*Cibotium Barometz, *J. Smith in Hook. London Journ. of Bot.* i. (1842) 437.

Dicksonia Baranetz, Link, Fil. sp. 166 (1841).

Kinabalu, Gurulau spur, 5000′, in high forest. Feb. 3999.

Distrib. Malay region, S. China, Assam.

"Splendid fronds, 5 m. long. Also in sec. forest ; but not seen with stem."

*Cyathea dulitensis, *Baker in Kew Bull.* (1896) 40.

Kinabalu, below Pakapaka cove, 9000′, in mossy forest. Feb. 4280.

Distrib. Borneo (Sarawak).

*Cyathea celebica, *v. Alderw. v. Rosenb. Malayan Ferns,* 26 (1908).

Kinabalu, Gurulau spur, 5000′, in high forest. Feb. 3988. A tree-fern, also common in sec. forest lower down.

Distrib. Celebes.

*Alsophila glauca, *J. Smith in Hook. Journ. of Bot.* iii. (1841) 419.

A. contaminans, Wall. Cat. n. 320, *fide* p. 64.

Kinabalu, bridle-path to Koung, 2000–4000′, in sec. forest. Feb. 3965.

Distrib. Borneo (Sarawak, *Beccari, Hose*). Tropical Asia.

"Common round Kiau. Height 2–3 m."

*Alsophila crinita, *Hook. Ic. Pl.* t. 671 (1844).

Kinabalu, Kamburangau to Pakapaka, 7000–9500′, in mossy forest. Feb. 4237.

Distrib. Java, Ceylon, S. India.

"Tree-fern, 1–2 metres high."

*Diacalpe aspidioides, *Blume, Enum. Pl. Jav.* 241 (1828).

Kinabalu, Maraiparai spur, 8000′, in mossy forest. Feb. 3108.

Distrib. Tropical Asia.

DRYOPTERIS IMMERSA, *O. Kuntze, Rev. Gen. Pl.* 813 (1891).
Nephrodium immersum, Hook. Spec. Fil. iv. 112.
Tenom, railway track to Rayoh, 700′, in sec. forest. Jan. 2939.
Distrib. Borneo (Sarawak). Malay Islands.
"Handsome fronds, 3 metres long; stem short."

DRYOPTERIS UNITA, *O. Kuntze, Rev. Gen. Pl.* 811 (1891).
Nephrodium cucullatum, Baker, Syn. Fil. 290.
Tambunan plain, near Station, 2000′, in boggy places in sec. forest. Feb. 3007.
Distrib. Borneo (B. N. B., *Burbidge*; D. Borneo). Malay Islands, Polynesia, Ceylon, S. India, Seychelles, Mascarene Islands.

*DRYOPTERIS STIPELLATA, *O. Kuntze, Rev. Gen. Pl.* 813 (1891).
Aspidium stipellatum, Blume, Enum. Pl. Jav. 152 (1828).
Kinabalu, Maraiparai spur, 7000′, in mossy forest. Feb. 4035.
Distrib. Sumatra, Java, Celebes.
"Tufted habit; fibrous-rooted."

DRYOPTERIS TRUNCATA, *O. Kuntze, Rev. Gen. Pl.* 814 (1891).
Nephrodium truncatum, Presl, Tent. 81.
Tenom, railway track to Rayoh, 700′, undergrowth in sec. forest. Jan. 2940.
Distrib. Borneo (Sarawak). Malay Islands, Polynesia, tropical Australia, India; E. African Islands.

DRYOPTERIS MOULMEINENSIS, *C. Chr. Ind. Fil.* 278 (1906).
Polypodium multilineatum, Wall. ex Hook. Spec. Fil. v. 11.
Tenom, 1300–2000′, old Residency and hills above, general in sec. and high forest, undergrowth. Jan. 2926.
Distrib. Celebes, Philippines, Fiji, China, India.

DIDYMOCHLÆNA TRUNCATULA, *J. Sm. in Hook. Journ. of Bot.* i. (1842) 196.
D. lunulata, Desv. Prod. 282.
Kinabalu, Kiau, 3000′, undergrowth in sec. forest. Feb. 4098.
Distrib. Borneo (B. N. B. Kinabalu, 3500′, *Burbidge*). Throughout the tropics.

CYCLOPELTIS PRESLIANA, *Berk. Introd. Crypt. Bot.* 513 (1857).
Aspidium semicordatum, Sw. in Schrad. Journ. Bot. 1800, part II. (1801) 31, partim.
Tenom, hills above, 1300′, undergrowth in high forest. Jan. 2879.
Distrib. Borneo (Sarawak). Malay Islands, Burma, Tonkin.

ASPIDIUM COADUNATUM, *Wall. Cat.* no. 377 (1828); *v. Alderw. v. Rosenb. Malayan Ferns*, 248 (1908).

Nephrodium cicutarium, Baker in Hook. & Bak. Syn. Fil. 299 (1867), in part.

Hills above Tenom, 1300′, undergrowth in high forest, abundant. Jan. 2880.

Distrib. Tropical Asia.

*POLYSTICHUM ARISTATUM, *Presl, Tent.* 83 (1836).

Aspidium aristatum, Sw. in Schrad. Journ. Bot. 1800, part II. (1801) 37.

Kinabalu, Gurulau spur, 5500′, in undergrowth of high forest. Feb. 2980. Between Kamburangau and Pakapaka, 9000′, in undergrowth. Feb. 4222.

Distrib. Borneo (Sarawak). Malay Islands, Polynesia, Japan to India, Natal.

NEPHROLEPIS BISERRATA, *Schott, Gen. Fil.* fasc. 1, in textu ad t. 3 (1834).

N. acuta, Presl, Tent. 79.

Tenom, 700–900′, general in damp open clearings. Jan. 2855. All through the country. Tambunan plain, near Station, 2000′, on sand in open scrub. Feb. 2999.

Distrib. Borneo (Sarawak; D. Borneo). All tropics.

NEPHROLEPIS ACUMINATA, *Kuhn in Ann. Mus. Lugd.-Bat.* iv. (1869) 286.

Nephrolepis davallioides, Kunze in Bot. Zeit. iv. (1846) 460.

Ridge above Bundu Tuhan, 2500′, epiphytic in sec. forest. Feb. 3953.

Distrib. Malay Islands.

"Length of frond 1·40 metres; tufted habit; fibrous-rooted."

HUMATA HETEROPHYLLA, *Desv. Prodr.* 323 (1825).

Hills above Tenom, 2000′, scandent and epiphytic in high forest. Jan. 2883.

Distrib. Borneo (B. N. B., *Burbidge*; Sarawak; D. Borneo). Malay Islands, Polynesia.

DAVALLIA CONTIGUA, *Spreng. in Schrad. Journ. Bot.* ii. (1799) 271.

Kinabalu, ridge before Kamburangau, 7000′, in undergrowth, on sand. Feb. 4138.

Distrib. Borneo (B. N. B., *Burbidge*, 10,500′, *Haviland*; D. Borneo). Malaya, Polynesia.

*DAVALLIA CONTIGUA, var. MONOSORA, *v. Alderw. v. Rosenb. Malayan Ferns*, 616 (1908).

Kinabalu, before Pakapaka, 9000–10,000′, epiphytic in moss. Feb. 4275.

Distrib. Java.

DAVALLIA SOLIDA, *Sw. in Schrad. Journ. Bot.* 1800, part II. (1801) 87.
Hills above Tenom, 2500′, scandent in high forest. Jan. 2894.
Distrib. Borneo (Sarawak; D. Borneo). Malay Islands, Polynesia, Queensland.

ODONTOSORIA CHINENSIS, *J. Sm. in Seem. Bot. Voy. 'Herald,'* 430 (1857).
Davallia tenuifolia, Sw. in Schrad. Journ. Bot. 1800, part II. (1801) 88.
Kaningau plain, 1000′, by a stream under trees. Feb. 2976.
Distrib. Borneo (B. N. B. Koung, *Burbidge*; Sarawak). Asia to Japan and Polynesia. Madagascar and Mascarene Islands.

*TAPEINIDIUM PINNATUM, *C. Chr. Index Fil.* 631 (1906).
Davallia pinnata, Cav. Descr. 277.
Kinabalu, Gurulau spur, 5500′, undergrowth in high forest. Feb. 3979.
Distrib. Borneo (Sarawak). Sulu Islands, Malaya, Polynesia.

*MONACHOSORUM SUBDIGITATUM, *Kuhn, Gruppe d. Chætopt.* 345 (1882).
Polypodium subdigitatum, Blume, Fl. Jav., Fil. 196 (1829).
Kinabalu, Maraiparai spur, 6000–7000′, undergrowth in mossy forest. Feb. 3111.
Distrib. Tropical Asia.
"Abundant, forming a well-marked zone; associated with *Trichomanes maximum*, Blume."

SCHIZOLOMA HETEROPHYLLUM, *J. Sm. in Journ. of Bot.* iii. (1841) 414.
Lindsaya heterophylla, Dryander, in Trans. Linn. Soc. iii. (1797) 41.
Hills above Tenom, 2200′, in undergrowth of high forest. Jan. 2895.
Distrib. Tropical Asia, S. China.

LINDSAYA JAMESONIOIDES, *Baker in Journ. of Bot.* xvii. (1879) 39.
Kinabalu, Maraiparai spur, 6000′, common in mossy forest. Feb. 4061.
Distrib. Borneo (B. N. B. Kinabalu, 5500′, *Haviland*; 9000′, *Burbidge*). Celebes.

*LINDSAYA PECTINATA, *Blume, Enum. Pl. Jav.* 217 (1828).
Kinabalu, Gurulau spur, 5000′, common, creeping on the ground in undergrowth of high forest, or on trees. Feb. 4001. Also on Maraiparai spur.
Distrib. Borneo (B. N. B., *Burbidge*). Tropical Asia.

*LINDSAYA DECOMPOSITA, *Willd. Sp. Plant.* v. 425 (1810).
L. lobata, Poir. Encyc. Méth. Suppl. iii. 448.
Kinabalu, Maraiparai spur, 6000′, in mossy forest. Feb. 3079.
Distrib. Borneo (Sarawak; D. Borneo); Sulu Islands. Tropical Asia to Polynesia.

*Diplazium polypodioides, *Blume, Enum. Pl. Jav.* 194 (1828).
Asplenium polypodioides, Mett. Fil. Lips. 78.
Kinabalu, Gurulau spur, 5000′, high forest undergrowth. Feb. 4000.
Distrib. Borneo (Sarawak). Malay Islands, tropical Australia, N. India.

Diplazium cordifolium, *Blume, Enum. Pl. Jav.* 190 (1828).
Asplenium cordifolium, Mett. Fil. Lips. 74.
Hills above Tenom, 1700′, common undergrowth of high forest. Jan. 2899.
Distrib. Borneo (B. N. B., *Burbidge*; Sarawak). Africa to Polynesia.
"Tufted habit; fibrous-rooted fronds 0·75–1 metre."

Asplenium dichotomum, *Hook. Spec. Fil.* iii. 210 (1860).
Ridge above Bundu Tuhan, 3000′, in sec. forest, epiphytic. Feb. 3946.
Distrib. Borneo (B. N. B. Kinabalu, *Low*; in shady jungle near Kiau, *Burbidge*). Endemic.

*Blechnum capense, *Schlecht. Adumbr. Fil.* 34 (1825).
Lomaria procera, Spreng. Syst. iv. 65.
Kinabalu, summit, 13,000′, in cracks of granite. Feb. 4309. Very dwarfed specimens.
Distrib. Borneo (B. N. B., *Burbidge*). Malay Islands, Polynesia, S. Africa; tropical America.

Blechnum orientale, *Linn. Sp. Pl.* 1077 (1753).
Kaningau plain, 1000′, on the bank of the river. Feb. 2975.
Distrib. Borneo (Sarawak, *Beccari*, *Hose*; D. Borneo). Tropical Asia, Polynesia, Australia.

Ceropteris calomelanos, *Underw. in Bull. Torr. Bot. Club*, xxix. (1902) 632.
Tenom, by the railway track to Rayoh, on the open embankment, 700′. Jan. 2941.
Distrib. Borneo (D. Borneo, *Winkler*). Tropical America, West Africa, Natal, Hawaii. Introduced into the Malay Isles; v. Alderwerelt v. Rosenburgh says (Malayan Ferns, 1909, 529): "Much cultivated, and escaped from gardens; very common now in the neighbourhood of European settlements."

Cheilanthes tenuifolia, *Sw. Syn. Fil.* 129, 332 (1806).
Tenom, 800′, Residency, on sandy soil in a clearing. Jan. 2779. Also in marshy places by bridle-path to Melalap, 700–900′. Jan. 2860.
Distrib. Borneo (B. N. B., *Burbidge*; D. Borneo). Tropical Asia, Australasia, Polynesia.

*PLAGIOGYRIA ADNATA, *Bedd. Ferns Br. Ind.* t. 51 (1865).

Lomaria adnata, Blume, Enum. Pl. Jav. 205 (1828).

Kinabalu, 7000–12,000′, from the ridge before Kamburangau to the granite core, abundant where open and dry. Feb. 4142.

Distrib. Java, Sumatra, Philippines; Japan; Yunnan; Khasia.

PTERIS DALHOUSIÆ, *Hook. Sp. Fil.* ii. 170, t. 121 A (1858).

Ridge above Tenom, 1300′, abundant undergrowth in high forest. Jan. 2878.

Distrib. Java, Sumatra, Penang.

"Height 0·75–1·0 metre; tufted-fibrous-rooted."

PTERIS QUADRIAURITA, *Retz. Obs. Bot.* vi. 38 (1791).

Above Bundu Tuhan, 2500′, ridge in sec. forest, undergrowth. Feb. 3943.

Distrib. Borneo (B. N. B., *Burbidge*; Sarawak; D. Borneo); Sulu Islands. All warm countries.

Transitional between this species and *P. biaurita.*

PTERIS TRIPARTITA, *Sw. in Schrad. Journ.* 1800, part II. (1801) 67.

P. marginata, Bory, Voy. ii. 192.

Tenom, 700–1000′, general in sec. forest, at edge of clearings. Jan. 2938.

Distrib. Tropics of Old World.

"Handsome fronds, over 1 metre across, very coriaceous. Young."

*VITTARIA PUSILLA, *Blume, Enum. Pl. Jav.* 199 (1828).

Kinabalu, Kamburangau to Pakapaka, 8000–10,000′, epiphytic on mossy stems. Feb. 4168.

Distrib. Borneo, Java, Malacca, Ceylon, Queensland.

*VITTARIA LINEATA, *Sm. in Mém. Acad. Turin*, v. (1793) 421.

Kinabalu, before Pakapaka, 9000′, epiphytic on mossy stems. Feb. 4242.

Distrib. Borneo (Sarawak; D. Borneo). Tropical Asia, Japan; tropical and S. Africa; America from Florida to Brazil.

TÆNITIS BLECHNOIDES, *Sw. Syn. Fil.* 24, 220 (1806).

Sarawak, near Kuching, Matang, 1000–2000′, in high forest. March. 4417.

Distrib. Borneo (B. N. B., *Burbidge*; D. Borneo); Sulu Islands. Tropical Asia to Fiji.

*POLYPODIUM LASIOSORUM, *Hook. Spec. Fil.* iv. 166 (1862).

P. hirtellum, Blume, Pl. Jav. 122 (1828), partim.

Kinabalu, Maraiparai spur, 6000′, epiphytic in mossy forest. Feb. 4062.

Distrib. Borneo (Sarawak ?); Java.

Common on all the ridges.

*POLYPODIUM PUBINERVE, *Christ. in Ann. Jard. Buitenz.* xv. (1898) 146.

Kinabalu, up to Pakapaka cave, 9000–10,000′, epiphytic on mossy stems. Feb. 4255.

Distrib. Java, Celebes.

*POLYPODIUM PLEIOSOROIDES, *Copeland in Perkins, Fragm. Flor. Philipp.* 189 (1905).

Kinabalu, ridge before Kamburangau, 7000′, epiphytic on mossy stems. Feb. 4141.

Distrib. Philippine Islands.

*POLYPODIUM FASCIATUM, *Presl, Tent.* 180 (1836).

Kinabalu, before Pakapaka, 9000–10,000′, epiphytic on mossy stems. Feb. 4272, 4265 *bis*.

Distrib. Malay Islands.

*POLYPODIUM ALTERNIDENS, *Cesati in Atti Accad. Napoli*, vii. (1876) 25.

Kinabalu, Kamburangau to the granite core, 8000–12,000′, epiphytic on mossy stems. Feb. 4229.

Distrib. Borneo (B. N. B., *Burbidge* ; Sarawak). Celebes.

POLYPODIUM CUCULLATUM, *Nees et Blume, in Nova Acta*, xi. (1823) 121.

Kinabalu, Gurulau spur, above Kiau, 5500′, epiphytic on mossy stems. Feb. 4017, 4018 *bis*.

Distrib. Borneo (B. N. B. Kinabalu, *Low* ; 10,500′, *Haviland*). Malay Islands, Ceylon, New Caledonia, Fiji.

*POLYPODIUM MALACCANUM, *Baker in Ann. of Bot.* viii. (1894) 129.

Kinabalu, near Pakapaka cave, 10,000′, epiphytic on mossy stems in low forest. Feb. 4251.

Distrib. Malacca.

*POLYPODIUM FUSCATUM, *Blume, Enum. Pl. Jav.* 129 (1828).

Kinabalu, ridge before Kamburangau, 7000′, epiphytic on mossy stems. Feb. 4139.

Distrib. Malay Islands, Perak.

POLYPODIUM CLAVIFER, *Hook. Spec. Fil.* iv. 176 (1862).

Kinabalu, from Kamburangau, 7000′, on the ridge, epiphytic on mossy stems. Feb. 4140.

Distrib. Borneo (B. N. B., *Burbidge, Low*) ; New Guinea.

*POLYPODIUM STENOPTERIS, *Baker in Journ. of Bot.* xvii. (1879) 43.

Kinabalu, from above Kamburangau to the granite core, 8000–12,000′, epiphytic on mossy stems. Feb. 4225.

Distrib. Borneo (B. N. B., *Burbidge*).

*POLYPODIUM TRIQUETRUM, *Blume, Enum. Pl. Jav.* 124 (1828).

Kinabalu, ridge above Lobang to Pakapaka, 6500–10,000′, undergrowth. Feb. 4155.

Distrib. Malay Islands, Samoa.

*POLYPODIUM INCURVATUM, *Blume, Enum. Pl. Jav.* 126 (1828).

Kinabalu, common between Kamburangau and Pakapaka, 7000–10,000′. Feb. 3110.

Distrib. Borneo (Sarawak). Malay Islands.

*CYCLOPHORUS ADNASCENS, *Desv. in Berlin Mag.* v. (1811) 300.

Polypodium adnascens, Sw. Syn. 25, 222.

Kinabalu, Gurulau spur, above Kiau, 5000′, epiphytic in mossy forest. Feb. 3995.

Distrib. Borneo (D. Borneo). Tropical Asia, Polynesia.

*PHOTINOPTERIS SPECIOSA, *Presl, Epimel.* 264 (1849).

Acrostichum rigidum, Wall. Cat. n. 27.

Kinabalu, Koung, 1000′, banks of the Tampussuk river, in sec. forest. Feb. 4338.

Distrib. Borneo (Sarawak). Malay Islands.

"Creeping rhizome, single fronds, apex sporangiferous."

CHEIROPLEURIA BICUSPIS, *Presl, Epimel.* 189 (1849).

Acrostichum bicuspe, Hook. Spec. Fil. v. 271.

Kinabalu, Gurulau spur, 5500′, in undergrowth of high forest. Feb. 3998. Also on the ridge before Kamburangau, 7000′, undergrowth, on sand. Feb. 4159. Abundant.

Distrib. Borneo (B. N. B. Kinabalu, 4000–8000′, *Burbidge*; Sarawak, *Hose, Brooks*). Sumatra, Java, New Guinea, Philippines, Liu-Kiu Islands, Formosa.

*Gleichenia circinnata, *Sw.*, var. borneensis, *Baker in Journ. of Bot.* xvii. (1879) 37.

Kinabalu, 9000′, to above Pakapaka, 11,000′. Abundant. Feb. 4226. Kamburangau to the granite core, 7500–12,000′, in undergrowth and open spaces. Feb. 4231.

Distrib. (of species). Borneo (B. N. B. Kinabalu, 5000–6000′, *Burbidge*; 10,500′, *Haviland*). Malayan region to Australasia.

*Gleichenia vulcanica, *Blume, Enum. Pl. Jav.* 251 (1828).

G. dicarpa, R. Br., var. *alpina*, Hook., ex Hook. & Baker, Syn. Fil. 12 (1874).

Kinabalu, Kamburangau, 7500′, in mossy forest. Feb. 4158. Marai-parai spur, 7000′, in mossy forest. Feb. 4086.

Distrib. Malay region.

"Common, scrambling over undergrowth and trees; associated with *G. Norrisii.*"

*Gleichenia Norrisii, *Mett. in Hook. & Baker, Syn. Fil.* 449 (1874).

Kinabalu, Gurulau spur, above Kiau, 5500′, amongst undergrowth in high forest. Feb. 3976.

Distrib. Malacca.

"Frond running up to 2–3 metres."

*Gleichenia glauca, *Hook. Spec. Fil.* i. 4 (1844).

G. longissima, Blume, Enum. Pl. Jav. 250 (1828).

Kinabalu, Kamburangau, undergrowth in mossy forest, 8000′. Feb. 4256.

Distrib. Borneo (Sarawak). Tropical Asia to Japan, Polynesia, and Australia.

*Gleichenia arachnoides, *Mett. in Ann. Mus. Lugd.-Bat.* i. (1863) 47.

G. longissima, var. *arachnoides*, Hook. & Baker.

Kinabalu. Feb. 3081.

Distrib. Malay Islands.

*Gleichenia lævigata, *Hook. Spec. Fil.* i. 10 (1846).

Kinabalu, common round Kiau, 3000′, in sec. forest and recent clearings. Feb. 3966.

Distrib. Malayan region.

"Associated with bracken and *Dipteris conjugata,* Reinw. Syll. pls. 2, 3 (1824)."

*Gleichenia vestita, *Blume, Enum. Pl. Jav.* 249 (1828).

Kinabalu, from Pakapaka to the granite core, 10,000–12,000′, in sheltered low forest and the sub-summit dwarf forest. Feb. 4269.

Distrib. Borneo (B. N. B., *Burbidge*; Sarawak). Malay Islands.

SCHIZÆA MALACCANA, *Baker in Hook. & Baker, Syn. Fil.* 428 (1868).

Kinabalu, Maraiparai spur, 5500′, on serpentine formation. Feb. 4039.

Distrib. Borneo (B.N.B. Kinabalu, 5000′, *Burbidge*). Malay Islands, Burma.

LYGODIUM CIRCINNATUM, *Sw. Syn. Fil.* 153 (1806).

Tenom, 700–1000′, very general in sec. forest, twining up the tallest trees. Jan. 2618.

Distrib. Borneo (Sarawak ; D. Borneo). Tropical Asia, Queensland.

LYGODIUM FLEXUOSUM, *Sw. in Schrad. Journ. Bot.* 1800, part II. (1801) 106.

L. pinnatifidum, Sw. in Schrad. Journ. Bot. 1801, part II. (1803) 303, partim.

Tenom, 700–1000′, everywhere in sec. forest, twining up trees. Jan. 2802.

Distrib. Borneo (D. Borneo). Tropical and temperate Asia, Australia.

General throughout the country.

EQUISETACEÆ. (A. GEPP.)

EQUISETUM DEBILE, *Roxb. in Vauch. Monogr. des Prêles*, 387 (1822).

Mensangau, 2050′, growing thickly on the banks of streams. Feb. 3029.

Distrib. Borneo (B. N. B., on banks of Kadamaian river below Kiau, 2000–2500′, *Low*, *Haviland*). Tropical Asia to Fiji.

LYCOPODIACEÆ. (A. GEPP.)

*LYCOPODIUM HIPPURIS, *Desv. in Poiret, Encyc. Méth., Bot., Suppl.* iii. 559 (1813).

Kinabalu, above the Lobang rock, 6000′, epiphytic in high forest. Feb. 4137.

Distrib. Borneo (Sarawak). Java.

LYCOPODIUM CASUARINOIDES, *Spring, Monogr. Fam. Lycop.* i. 94 (1842).

Kinabalu, from Kamburangau upwards, 7500–9000′. Feb. 3082.

Distrib. Borneo (B. N. B. Kinabalu, 6000′, *Burbidge* : at high altitudes, *Low* : 8700′, *Haviland*). Malay Islands to China and India.

*MARSILEA QUADRATA, *A. Br. in Berl. Monatsb. Preuss. Akad.* 745 (1870).

Tuaran, 300′, bridle-path to Menkabong, in an open ditch, abundant. March. 4351.

Distrib. Borneo (B. N. B., *Low*).

*LYCOPODIUM SCARIOSUM, *Forst. f. Prodr. Flor. Ins. Austral.* 87 (1786).

Kinabalu, above and below Pakapaka, 9000–11,000′, in open places and under open scrub. Feb. 4262.

Distrib. Borneo, Philippines, Australia, S. America.

LYCOPODIUM VOLUBILE, *Forst. f. Prodr. Flor. Ins. Austral.* 86 (1786).

Kinabalu, Kamburangau to the granite core, 7500–12,000′, in open scrub. Feb. 4146.

Distrib. Borneo (B. N. B., *Burbidge* : 8000′, *Low*). Penang to Polynesia, Australia, and New Zealand.

SELAGINELLACEÆ. (A. GEPP.)

*SELAGINELLA PLUMOSA, *Baker in Journ. of Bot.* xxi. (1883) 144.

Kinabalu, Gurulau spur, 5500′, in undergrowth in high forest. Feb. 3981.

Distrib. Malay Islands to India and S. China.

SELAGINELLA ALOPECUROIDES, *Baker in Journ. of Bot.* xix. (1881) 368.

Hills above Tenom, 1500′, creeping in undergrowth of high forest. Jan. 2903.

Distrib. Borneo (*Curtis*).

SELAGINELLA WALLICHII, *Spring, Monogr. Fam. Lycop.* ii. 143 (1849).

Hills above Tenom, 1300′, in undergrowth of high forest. Jan. 2891.

Distrib. India to the Malay Islands and New Guinea.

SELAGINELLA WILLDENOWII, *Baker in Gard. Chron.* (1867) 950.

Kinabalu, Maraiparai spur, 6000–8000′. Feb. 4073. (Fronds erect). Bridle-path to Kabayo, 1000′, in sec. forest. Feb. 4298. (Frond large). Plant generally distributed.

Distrib. Borneo (B.N.B., near Kiau, *Burbidge*) ; Sulu Islands. India to the Malay Islands.

SELAGINELLA PENTAGONA, *Spring, Monogr. Fam. Lycop.* ii. 150 (1849).

Hills above Tenom, 1500′, in undergrowth of high forest. Feb. 2890. Tambunan, between Apin Apin and Tambunan, 2000′, in undergrowth of sec. forest. Feb. 2984.

Distrib. India.

"Growing in clumps; fronds dark green, lighter beneath ; spreading."

SELAGINELLA PRONIFLORA, *Baker in Journ. of Bot.* xxiii. (1885) 156.

Kaningau plain, 1000′, spreading in marshy places. Feb. 2962.

Distrib. India to the Malay Islands, N. Australia.

The three following plants remain uncertain:—

SELAGINELLA sp.
Kinabalu, Maraiparai spur, 6000–8000′, in undergrowth of mossy forest. Feb. 4072.

SELAGINELLA sp.
Kinabalu, Maraiparai spur, 8000′, in undergrowth of mossy forest. Feb. 4032.

SELAGINELLA sp.
Hills above Tenom, 1500′, in undergrowth of high forest. Jan. 2901.

BRYOPHYTA. (A. GEPP.)

MUSCI.

*SPHAGNUM GEDEANUM, *Doz. et Molk. in Bryol. Javan.* i. 28 (1855).
Kinabalu, above Lobang rock, 7000′, and higher in mossy forest and upwards. Feb. 4145.
Distrib. Java, Khasia.

CAMPYLOPUS EXASPERATUS, *Brid. Bryol. Univ.* i. 473 (1826).
Kinabalu, Kamburangau, 7500′, on sandy soil in open places, amongst dense growth of *Patersonia* sp. Feb. 4163.
Distrib. Borneo (B. N. B. Kinabalu, 9000′, *Low*: Penokok, 3200′, *Haviland*; D. Borneo). Java, Celebes, Ceylon, Hawaii.

*BRAUNFELSIA SCARIOSA, *Paris Index Bryol.* 148 (1894). (*Dicranum scariosum,* Wils. in Kew Journ. Bot. ix. (1857) 294.)
Kinabalu, Pakapaka cave, 10,000′, in undergrowth of sheltered low forest. Feb. 4175.
Distrib. Borneo, Ceylon.

*LEUCOBRYUM JAVENSE, *Mitt. in Journ. Linn. Soc., Bot.* iii. *Suppl.* 25 (1859).
Kinabalu, Kiau, 2700′, on the ground in sec. forest and under bracken. Feb. 3961.
Distrib. Borneo, Malay Islands, New Guinea, Japan, S. China, India, Hawaii.

RHIZOGONIUM SPINIFORME, *Bruch in Flora*, xxix. (1846) 134.
Kinabalu, Tenumpok ridge, 4000′, on dead wood, in high forest. Feb. 3954.
Distrib. Borneo (B. N. B., *Burbidge*). Malay Islands and the tropics.

RHACELOPUS ACAULIS, *Mitt. apud Stapf in Trans. Linn. Soc.* ser. 2. *Bot.* iv. (1894) 258.

Between Koung and Kabayo, 1000′, on damp bank, in old sec. forest. Feb. 3119.

Distrib. Borneo (B. N. B., *Burbidge*).

DAWSONIA ALTISSIMA, *Geheeb in Flora*, lxix. (1886) 352, $=$ *D. superba* alior.

Kinabalu, Kamburangau and above, 8000′, in mossy forest. ♂. Feb. 3118. Gurulau spur, above Kiau, 5000′, in high forest. ♂. Feb. 3992.

Distrib. Borneo (B. N. B. Kinabalu, *Burbidge*).

"Also seen on Maraiparai spur, in mossy forest, 6000′" *.

*DAWSONIA BREVIFOLIA, *A. Gepp*, sp. nov.

Cum *D. Beccarii*, Broth. et Geh., maxime congruit, differt tamen foliis magis appressis e basi vaginante erectis haudquaquam geniculatis, lineari-lanceolatis acutis ; foliorum lamellis 100 μ altis, e 6–7 seriebus cellularum constructis ; thecâ juniore erectâ, demum horizontali.

Hab. Kinabalu, 9000′, on exposed serpentine. The male and female plants in separate patches. Feb. 3117.

This is a tall slender dioicous species with short appressed leaves. The fertile stems are but little shorter than the sterile, which attain 30 cm. The leaves are wider (being 0·75 mm. wide) and shorter than those of the New Guinea *D. Beccarii* (compare Geheeb's account in 'Bibliotheca Botanica,' Heft 44, Stuttgart, 1898, p. 14, tab. 12), the cauline measuring 8 mm., the comal 14 mm. The leaves also are canaliculate, and their lamellæ are half again as high as those of *D. Beccarii*, and are crenulate along their upper margin, as in that species. The male plant is simple, often repeatedly proliferous, 1–6-flowered. The female plant is sometimes divided above, bearing 2–4 short branches, mostly fertile. Mature theca horizontal. Seta 2–2·5 cm. long.

* These specimens approximate very closely to *D. superba*, Grev., but tend to have fewer horizontal rows of cells in their lamellæ. This, however, is a variable character. It is convenient to retain Geheeb's name of *D. altissima* for these Borneo plants, and to regard *D. superba* as a species confined to East Australia, Tasmania, and New Zealand. For to suppose that the distribution of *D. superba* embraces North Borneo and excludes New Guinea requires a liberal stretch of imagination. The distribution of the other species of *Dawsonia* is quite limited. Six of them occur in Australia, four in New Guinea, and two in Borneo. And not one of them appears to be common to any two of these regions.

HEPATICÆ.

RICCIA FLUITANS, *Linn. Sp. Pl.* ed. 2. 1606 (1763).

Tenom, 700′, railway track to Rayoh, abundant in damp places. Jan. 2937. Melalap, clearing in secondary forest. Jan. 2766.

Distrib. Cosmopolitan.

RICCIOCARPUS NATANS, *Corda in Opiz Beiträge*, 651 (1828).

Tenom, 700′, railway track, in a stagnant pool in marshy clearing. Jan. 2817.

Distrib. Europe, Japan, China, Indo-China, Australia, New Zealand, Brazil, Mexico.

*REBOULIA HEMISPHÆRICA, var. JAVANICA, *Schiffn. in Denksch. K. Akad. Wiss. Wien*, lxvii. (1898) 155.

Kinabalu, near Lobang rock, 5000′, on the ground, in high forest. Feb. ♀. 3114.

Distrib. Java, Sumatra.

*MARCHANTIA EMARGINATA, *Reinw. ex Blume et Nees, in Act. Nat. Cur.* xii. 1. 192 et 409 (1824).

Mensangau, 1000′, on a damp bank; Feb. ♀. 3027. Koung, 1000′, damp bank in sec. forest. Feb. 4287. (Showing vegetative proliferation of ♀ sporophores.)

Distrib. Java, Sumatra.

*SCHISTOCHEILA WALLISII, *Jack et Steph. in Hedwigia*, xxxi. (1892) 26.

Kinabalu, Gurulau spur, above Kiau, 5000′, on dead wood, in high forest. Feb. 4015.

Distrib. Philippine Islands.

FUNGI. (A. LORRAIN SMITH).

HELOTIACEÆ.

TRICHOSCYPHA INSITITIA, *Sacc. Syll. Fung.* viii. 161 (1889).

Tenom, Rayoh hills, 2000′, dead wood in high forest. Jan. 2905.

Distrib. Bonin Islands and Ceylon.

The spores in this specimen measure up to $50 \times 10\ \mu$.

TRICHOSCYPHA HINDSII, *Sacc. Syll. Fung.* viii. 161 (1889).

Tenom, 7900′, red, on dead wood and on the ground in sec. forest. Jan. 2835.

Distrib. Ceylon, Cuba, Brazil, etc.

Trichoscypha tricholoma, *Sacc. Syll. Fung.* viii. 160 (1889).
Tenom, foothills, 900′, delicate light red, abundant on dead wood in sec. forest. Jan. 3106.
Distrib. Ceylon, West Indies.

XYLARIACEÆ.

Hypoxylon rubiginosum, *Fries, Summa Veg. Scand.* 384 (1846).
Tenom, foothills, 900′, on trees in sec. forest. Jan. 2709.
Distrib. Asia, Africa, Europe, America.
Cosmopolitan in temperate, tropical, and subtropical regions.

THELEPHORACEÆ.

Stereum elegans, *Fries, Epicr.* 545 (1836–38).
Tenom, 700′, near the railway track, growing abundantly on dead wood, in bog. Jan. 2834.
Distrib. Australia, Tasmania, New Zealand, Ceylon, West Africa, and South America.

Stereum lobatum, *Fries, Epicr.* 547 (1836–38).
Tenom, 700–900′, yellow, on dead wood in sec. forest. Jan. 2707, 2836 *bis*.
Distrib. Frequent in tropical countries, Java, Ceylon, India, Brazil.

Pterula subulata, *Fries, in Linnæa*, v. (1830) 532, t. 2. f. 4.
Tenom, foothills, 900′, on the ground and on dead wood in forest. Jan. 2711.
Distrib. Southern Europe.

Lachnocladium furcellatum, *Lev. in Orb. Dict.* viii. p. 487.
Tenom, Rayoh hills, 2000′, dead wood in high forest. Jan. 2904.
Distrib. Rather common in tropical regions.

POLYPORACEÆ.

Polystictus sanguineus, *Fries, Nov. Symb.* 75 (1851).
Tenom, 700–900′, on dead wood in sec. forest. Jan. 2706.
Distrib. Common in tropical and subtropical regions.

Polystictus rigens, *Sacc. Syll. Fung.* vi. 274 (1882).
Tenom, 700–900′, on dead wood in sec. forest. Jan. 2708.
Distrib. Malaya to India. Tropical and subtropical regions.

Polystictus xanthopus, *Fries, Nov. Symb.* 74 [*in Act. R. Soc. Sci. Upsala*, ser. 3, vol. i. (1851)].
Tenom, 700′, common on dead wood in sec. forest and clearings. Jan. 2837.
Distrib. Common in tropical countries.

Polystictus flavus *Lloyd, Myc. Notes*, no. 34 (1910) 450.
Tenom, foothills, on dead wood in sec. forest. Jan. 2715.
Distrib. All over the tropics. Originally from Java.

Favolus nummularius, *Berk. in Hook. Lond. Journ. of Bot.* i. (1842) 455, t. 15.
Tenom, 900′, foothills, on dead wood in sec. forest. Jan. 2714.
Distrib. Solomon Islands.

*Favolus rhipidium, *Berk. in Hook. Journ. of Bot.* vi. (1847) 319.
Kinabalu, Pakapaka cave, 10,000′, dead wood in sheltered forest. Feb. 3105.
Distrib. Borneo (Sarawak). Ceylon, N. & S. America.

AGARICACEÆ.

Schizophyllum commune, *Fries, Syst. Myc.* i. 330 (1825).
Tenom, 700′, common on dead wood. Jan. 2647.
Distrib. Widely distributed in the warmer regions.

Lentinus Hookerianus, *Berk. in Kew Journ. Bot.* iii. (1851) 44.
Near Tenom, 700′, on dead wood in sec. forest. Jan. 2646.
Distrib. India and Ceylon.

LYCOPERDACEÆ.

Geaster mirabilis, *Mont. in Ann. Sci. Nat.* sér. 4, iii. (1855) t. 6. f. 8.
Tenom, 700′, the banks of a stream, in sec. forest. Jan. 3104.
Distrib. Tropics and subtropics of Asia, Africa, and America.

Geaster velutinus, *Morg. Journ. Cinc. Soc. Nat. Hist.* xvii. (1895) 38, t. 1. f. 7.
Tenom, Rayoh hills, 2000′, in forest. Jan. 3103.
Distrib. N. America.

Ozonium sp.
Tenom, 900′, on dead wood in sec. forest. Jan. 2710.

LICHENS. (A. Lorrain Smith.)

CLADONIACEÆ.

Cladonia Floerkeana, *Fries, Nov. Sched. Crit.* 18 (1826).
Patau Patau, 1200′, open clearing on sand. Feb. 3028.
Distrib. New Caledonia, tropical America, general in Europe.

ALGÆ.

CHARACEÆ. (Henry Groves.)

Nitella acuminata, *A. Braun, in Kew Journ. Bot.* i. (1849) 292.
Between Tenom and Melalap, 700′, by the railway track, in a ditch in a recent clearing. Jan. 2849.
Distrib. General in tropics and subtropics.
The plant is a very small form. I suppose it would come under Braun's var. *indica*, though it is much smaller than any form we have from that part of the world. We have an equally small form from Brazil. The species is very common in the tropics, occurring throughout India, Ceylon, Straits Settlements, Java, also in Japan and in tropical Africa and Mauritius. It is one of the commonest species in the West Indies and Northern South America and Southern North America. The plant is immature, and it is difficult to say very much about young states.

MARINE ALGÆ. (E. S. Gepp.)

SPHÆROCOCCACEÆ.

Corallopsis Opuntia, *J. Ag. Epicr.* 409 (1876).
Usakan Bay, beach. March. 3058.
Distrib. Coasts of Ceylon.

Hypnæa nigrescens, *J. Ag. Alg. Liebm.* 14, *in Stockh. Öfvers. Handl.* (1847).
Labuan, beach. Dec. 3056.
Distrib. Java, and coasts of India.

RHODOMELACEÆ.

Laurencia papillosa, *Grev. Alg. Brit. Syn.* p. lii. (1830).
Usakan Bay, beach. March. 3059.
Distrib. Red Sea and Indian Ocean, Sandwich Islands, Mediterranean and coasts of the warmer regions of the Atlantic Ocean.

LAURENCIA sp.
Labuan, beach. Dec. 3057.

ACANTHORA ORIENTALIS, *J. Ag. Sp. Alg.* ii. 820 (1863).
Labuan, beach. Dec. 3055.
Distrib. Java, Philippines, Marianne and Tonga Islands; N. Australia, Zanzibar.

DICTYOTACEÆ.

GYMNOSORUS VARIEGATUS, *J. Ag. Analecta algologica cont.* i. 11 (1894).
Usakan Bay, beach. March. 3054.
Distrib. Philippines and Tongatabu, Red Sea, Canary Islands, Antilles and Brazil.

PADINA COMMERSONI, *Bory in Duperrey, Voy. Coq., Crypt.* 144, *Atl. bot.* tab. 21. fig. 2.
Labuan, beach. Dec. 3050.
Distrib. Coasts of Pacific Ocean from N. tropical Australia to Japan, Red Sea, and coasts of Florida and West Indies.

DICTYOTA DICHOTOMA, *Lamour. in Desv. Journ. de Bot.* ii. (1809) 42.
Usakan Bay, beach. March. 3053.
Distrib. General in tropical and temperate seas of the old world.

SARGASSACEÆ.

SARGASSUM POLYCYSTUM, *J. Ag. Syst.* 304 (1824).
Labuan, beach. Dec. 3052.
Distrib. Coasts of India and Cochin China, Singapore, Batavia, Celebes and Philippines, Tongatabu and Isle of France.

TURBINARIA CONOIDES, *Kütz.*, var. EVESICULOSA, *E. S. Barton in Trans. Linn. Soc.* ser. 2. *Bot.* iii. (1891) 217, t. 54. fig. 1.
Labuan, beach. Dec. 3051.
Distrib. Islands of Edam and Enkiuzen, near Batavia.

FUCACEÆ.

HORMOSIRA ARTICULATA, *Zan. Plant. Mari Rubro Enum.* i. 35 (1858).
Labuan, beach. Dec. 3048.
Distrib. Red Sea.

ENCŒLIACEÆ.

Colpomenia sinuosa, *Derb. et Sol. Mém. phys. Alg.* t. 22. figs. 18–20 (1856).

Labuan, beach. Dec. 4236.

Distrib. Wide, in tropical and temperate seas.

Hydroclathrus cancellatus, *Bory, Dict. Class.* viii. 419 (1826).

Labuan, beach. Dec. 3049.

Distrib. Borneo (Sarawak). Warmer regions of Pacific and Atlantic Oceans, through the Red Sea and the Mediterranean (Spain).

ULVACEÆ.

Enteromorpha compressa, *Grev. Alg. Brit.* 180 (excl. var.), t. 18 (1830).

Usakan Bay, beach. March. 3062.

Distrib. Coasts of Greenland and N. America, Hawaiian Islands, New Zealand and Tasmania ; Caspian.

CLADOPHORACEÆ.

Chætomorpha obscura, *Kjellm. in Bot. Not.* (1880) 117.

Usakan Bay, beach. March. 3061.

Distrib. Ceylon.

UDOTEACEÆ.

Halimeda Opuntia, *Lamour. in Soc. Phil. N. Bull. Par.* iii. (1812) 186, var. typica, *E. S. Barton in Siboga Exp., Monog.* lx. 20 (1901).

Usakan Bay, beach. March. 3063.

Distrib. Warmer regions of Atlantic and Pacific Oceans. Red Sea and Indian Ocean.

Halimeda tuna, *Lamour. in Soc. Phil. N. Bull. Par.* iii. (1812) 186.

Usakan Bay, beach. March. 3064.

Distrib. General in Mediterranean ; Atlantic Ocean on the coasts of Florida and Barbados ; Nicobar Islands.

Udotea orientalis, *A. & E. S. Gepp, Siboga Exp., Monog.* lxii. 119 (1911).

Usakan Bay, beach. March. 3065.

Distrib. Sulu Archipelago ; Queensland, China Sea and Japan, Zanzibar and Natal.

OSCILLATORIACEÆ.

LYNGBYA MAJUSCULA, *Harv. in Hook. Engl. Fl.* v. pt. i. 370 (1833).
Labuan, beach. Dec. 3060.
Distrib. Cosmopolitan.

FRESHWATER ALGÆ. (W. WEST.)

The collections were preserved in formalin in numbered tubes; about a third of them were from true aquatic habitats, the rest were scrapings from rocks, logs, damp earth, etc. In a few cases (radical pitchers of *Nepenthes*) no algæ were found, or not in sufficient quantity for determination. There were also many filamentous species which could not be determined owing to lack of zygospores, such as species of *Zygnema*, *Spirogyra*, etc.

RHODOPHYCEÆ.

NEMALIONALES.

BATRACHOSPERMUM VAGUM, *J. Ag. Syst.* 52.
Sarawak, Matang, pipe-track, in ditch. March. 4412.
Distrib. Europe and America.

CHLOROPHYCEÆ.

ŒDOGONIALES.

BULBOCHÆTE sp.	2819.	Only a fragment seen, 17 μ broad.
ŒDOGONIUM sp.	2767, 2964.	11–12·5 μ broad, cells 3 to 4 times longe
,,	2819.	3–4 μ broad, cells 14–17 μ long.
,,	2936.	20 μ broad, cells $2\frac{1}{2}$ to 3 times longer.
	2657.	8–11 μ broad, cells 4–7 times longer, attached to *Lemna*.
,,	4412.	18–19 μ broad, cells 4 times longer.
,,	4413.	6–7 μ broad, cells 3–5 times longer.

CHÆTOPHORALES.

COLEOCHÆTE NITELLARUM, *Jost. in Ber. Deutsch. Bot. Ges.* xiii. (1895) 434, t. 34.
Tenom, 700′, on submerged plants in ditch. Jan. 3080.
Distrib. Europe.

ULOTHRIX SUBTILIS, *Kütz. Phyc. Germ.* 197.
Tenom, 700′, on *Lemna* in ditch. Jan. 2657. 8 μ broad.
Distrib. Europe, Ceylon, N. America, S.W. Africa.

ULOTHRIX SUBTILIS, *Kütz.*, var. VARIABILIS, *Kirchen. Algenfl. Schles.* 77.
Sarawak, Matang, 1000′, on damp bank. March. 4401. 5 μ broad.
Distrib. Europe, N. America, S.W. Africa.

ULOTHRIX INÆQUALIS, *Kütz. Phyc. Germ.* 196.
Distrib. Europe, United States.

TRENTEPOHLIA sp. 3141. 15–18 μ broad, cells somewhat torulose, branches attenuated; not sufficient material for full determination; the same applies to the other species.
„ 4005. Green, 8·5–10 μ broad, cells 2½–4 times longer.
„ 2914. 15–19 μ broad, cells 1½–2½ times longer.
„ 2839. Green, 11–13·5 μ broad.
„ 2914. 22–24 μ broad, cells 1½ times longer, with unripe lateral zoogonidia.

Some of these *Trentepohlia* were beginning to be enveloped with hyphæ, showing incipient stages of some lichens. This remark also applies to several other genera on this list.

MICROSPORALES.

*MICROSPORA PACHYDERMA (*Wille*), *Lagerh., Zur Entwickl. einig. Conferv.* 417.

Kinabalu, summit, 12,500′, where the Kadamaian flows over granite. Feb. 4211. 18 μ broad.

Distrib. Sweden, Bohemia, England.

CLADOPHORALES.

PITHOPHORA sp. 4023. 13–15 μ broad. Spores intercalary and doliform or ellipsoid, sometimes as many as 8, successively 24–28×50–70 μ.
„ 2822. 63–80 μ broad, spores cylindrical, intercalary, and terminal, 68×88 μ.

*RHIZOCLONIUM HIEROGLYPHICUM, *Kütz. Phyc. Germ.* 206.

Tenom, 700′, on submerged plants in ditch. Jan. 3080. 16–17 μ broad, cells about 4 times longer.

Kinabalu, summit, 12,500′, where Kadamaian flows over granite. Feb. 4211. 10–18 μ broad, cells 2–4 times longer.

Sarawak, Matang, 700′, under waterfall. March. 4404. 11–12 μ broad.

Distrib. Middle and South Europe, N. & S. America; Fiji.

CONJUGATÆ.

ZYGNEMA sp. 4023. 19 μ broad, cells 1½–2 times longer.

SPIROGYRA sp. 2829, 2964. 50–56 μ broad, cells 2½–3 times longer, ends not replicate, chloroplasts 3–4.

„ 2911, 2815. 41–55 μ broad, cells 1½–3 times longer, ends not replicate, chloroplasts 3.

„ 2851, 2850. 48–52 μ broad, cells 1½ times longer, ends not replicate, chloroplasts 2.

„ 3080. 56–65 μ broad, cells twice as long, ends not replicate, chloroplasts 3.

„ 2829. 23–25 μ broad, cells 7–8 times as long, ends not replicate, chloroplast 1.

„ 2911. 30–31 μ broad, cells 6 times longer, ends not replicate, chloroplasts 4.

„ 2911. 20–23 μ broad, cells 3–4 times longer, ends not replicate, chloroplast 1.

„ 4413. 27–28 μ broad, cells 4–5 times longer, ends not replicate, chloroplasts 2 (–3).

GONATONEMA VENTRICOSUM, *Wittr. Hedwigia* (1879), 124.

Sarawak, Matang, 2800′, among *Sphagnum*. March. 4411.

Distrib. First collected in hot-water tank in Upsala Botanical Gardens; Ireland; N. America.

GONATOZYGON MONOTÆNIUM, *De Bary in Rabenh. Alg.* n. 529 (1856).

Tenom, 700′, on submerged plants in ditch. Jan. 2819. 85 × 8 μ, 80 × 7 μ, 126–8 × 5 μ.

Distrib. Europe (throughout); India, Ceylon, Sumatra, Siam; W., Central, and E. Africa; Greenland, United States, W. Indies, Brazil.

MESOTÆNIUM CHLAMYDOSPORUM, *De Bary, Conj.* 75, t. 7 D.

Sarawak, Matang, 2800′, on *Sphagnum*. March. 4411. 23·3 × 11·6 μ.

Distrib. Europe, S. America, W. Indies, India.

MESOTÆNIUM ENDLICHERIANUM, *Näg. Gatt. einz. Algen*, 108, t. 6 B.

Sapong, 800′, damp place on young rubber plantation. Jan. 2716. 27–29 × 9–10 μ.

Distrib. Europe, N. America, W. Indies, Australia.

MESOTÆNIUM KRAMSTAI, *Lemm. in Forschungsb. Biol. Stat. Plön*, iv. 115, cum fol. 8–10. p. 116.

Sapong, 800′, damp place on young rubber plantation. Jan. 2716. 55 × 8 μ.

Distrib. England, Germany, W. Indies.

*MESOTÆNIUM MACROCOCCUM, *Roy & Biss.*, var. MICROCOCCUS, *W. & G. S. West.*

Kinabalu, 12,500′, summit where Kadamaian streams over granite. Feb. 4211. 17 × 10 *μ*. Sarawak, Matang, 1000′, on damp bank. March. 4401. A narrow form, 17–5 × 7·5 *μ*. Sarawak, Matang, 1000′, on damp wood. March. 4406. 19 × 11·5 *μ*.

Distrib. Europe, United States, W. Indies.

*CYLINDROCYSTIS BREBISSONII, *Meneg.* [1838] *Cenni sull' organ.* 5 et 26.

Kinabalu, summit, 12,500′, where Kadamaian flows over granite. Feb. 4211.

Distrib. Europe, N. & S. America, Siberia, Burma, India, Siam, Java, Australia, New Zealand, E. Africa, W. Indies, Greenland, Spitzbergen, Nova Zembla.

*CYLINDROCYSTIS BREBISSONII, var. MINOR, *W. & G. S. West, in Trans. Irish Acad.* xxxii. (1902), p. 20, t. 2. f. 7.

Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Feb. 4211. Sarawak, Matang, 1000′, on damp wood. March. 4406. 26·5–27·5 × 12–15·5 *μ*.

Distrib. British Isles.

*CYLINDROCYSTIS CRASSA, *De Bary, Conj.* 74, t. 7 c.

Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Feb. 4211.

Distrib. Europe, Sandwich Islands, United States, Singapore, Madagascar, West Africa, New Zealand.

*PENIUM CRUCIFERUM, *Wittr. in Wittr. & Nordst.* Fasc. 21 (1884) 48.

Kinabalu, Gurulau spur, 5000′, on damp earth. Feb. 4023. 24 × 12 *μ*.

Distrib. Europe, E. Africa, New Zealand, United States, W. Indies.

PENIUM CLEVEI, *Lund.*, var. CRASSUM, *W. & G. S. West in Journ. Roy. Micr. Soc.* (1894) 4, t. 1. f. 5.

Tenom, 700′, in the open, on damp ground. Jan. 2936. 71 × 37 *μ*.

Distrib. England (Cumberland).

PENIUM EXIGUUM, *West*, var. SUBROTUNDATUM, *West*, var. nov. Var. apicibus non dilatis sed subrotundatis. 31–32 × 7·5 *μ*.

Sarawak, Matang, 1000′, on damp wood. March. 4406.

PENIUM SPINOSPERMUM, *Josh. in Journ. Bot.* xxxi. (1883) 292, t. 254–10.

Sarawak, Matang, 1000′, on damp wood. March. 4406.

Distrib. England, Scotland, Ireland, Ceylon.

PENIUM TRUNCATUM, *Ralfs, Brit. Desmid.* 152, t. 25. f. 5.

Sarawak, Matang, 1000′, on damp wood. March. 4406. A narrow form, 26 × 9 μ.

Distrib. Europe, N. America.

PENIUM POLYMORPHUM, *Perty, Kleinste Lebensf.* 207, t. 16. f. 15.

Melalap, 800′, on log in river. Jan. 2767. 38 × 20·8 μ. Senagong, 1000′, on stones and dead leaves in stream. Jan. 2963. A rather wide form, 38 × 22·5 μ.

Distrib. France, Germany, Austria, Lapland, Switzerland, Sweden, N. America, New Zealand, Azores, India.

PENIUM CURTUM, *Bréb. in Kütz. Spec. Alg.* 167.

Sarawak, Matang, 700′, under waterfall. March. 4404 *b*. 33 × 16 μ.

Distrib. Europe and N. America, W. Indies, Greenland, Spitzbergen, Nova Zembla, Franz-Joseph Land, India, Burma, Siam, W. Africa, Madagascar.

CLOSTERIUM EHRENBERGII, *Meneg. in Linnæa*, xiv. (1840) 232.

Tenom, 700′, on submerged plants in ditch. Jan. 3080. 391 × 70 μ.

Distrib. Europe, N. & S. America, W. Indies, Japan, India, Siam, New Zealand, Faeroes, Central China, Samoa, Central & E. Africa, Brazil, Uruguay, Patagonia.

CLOSTERIUM LEIBLEINI, *Kütz. in Linnæa*, viii. (1833) 596.

Tenom, 700′, on floating plants in ditch. Jan. 2838. A form with rather thicker apices, 100 × 16·6 μ.

Distrib. Europe, Faeroes, Iceland, N. & S. America, Burma, Mongolia, Japan, Australia, Madagascar, tropical Africa, Ceylon, India, Samoa, Brazil, Argentina, Uruguay, Patagonia, W. Indies.

CLOSTERIUM MONILIFERUM, *Ehrenb. ex Pritch. Infus.* ed. 4. 748 (1861).

Tenom, 700′, submerged plants in ditch. Jan. 3080. 262 × 43 μ. Tenom, 700′, among *Ricciocarpus* in ditch. Jan. 2657. Tenom, among *Azolla*. Jan. 2816. Small forms 20131 μ, 195 × 28 μ. A stout form also in 2657, 344 × 60 μ.

Distrib. Europe, N. America, Singapore, Ceylon, New Zealand, Brazil, Argentina, Uruguay, Patagonia.

CLOSTERIUM PARVULUM, *Näg. Gatt. einz. Algen*, 106, t. 6 c. f. 2.

Sarawak, Matang, pipe-track, among algæ in peaty water. March. 4413.

Distrib. Europe, N. America, Sandwich Islands, Brazil, Ecuador, Patagonia, Nova Zembla, Greenland, Siberia, Japan, Ceylon, Siam, Sumatra, Java, Samoa, Australia, Central & E. Africa.

CLOSTERIUM PRONUM, *Bréb. Liste*, 157, n. 38, t. 2. f. 42.

Tenom, 700′, among sodden and dead leaves in forest. Jan. 2815. 475 × 12 μ.

Distrib. Europe, Greenland, Japan, Java, Australia, Central & E. Africa, United States, Guiana, Patagonia.

CLOSTERIUM TUMIDUM, *Johns. in Bull. Torr. Bot. Club*, xxii. (1895) 291.

Tenom, 700′, among *Azolla*. Jan. 2816. 123 × 15 μ. Tenom, 700′, among floating plants in ditch. Jan. 2838. 133 × 17 μ.

Distrib. N. America, Victoria Nyanza, Nova Zembla, Siam, Celebes, Samoa, Brazil, Paraguay, Patagonia.

PLEUROTÆNIUM EHRENBERGII, *De Bary, Conj.* 75.

Tenom, 700′, among *Azolla* in ditch. Jan. 2816. Tenom, among floating plants in ditch. Jan. 2838.

Distrib. Europe, tropical Africa, Madagascar, New Zealand, Australia, Samoa, Sumatra, Java, Ceylon, India, Central China, Siberia, Nova Zembla.

PLEUROTÆNIUM TRABECULA, *Näg. Gatt. einz. Algen*, 104, t. 6. f. A (1848).

Tenom, 700′, among *Azolla* in ditch. Jan. 2816. 470 × 26 μ, 31–32 μ at base of semicells; other examples were 31 μ broad.

Distrib. Europe, N. & S. America, Siberia, Sandwich Islands, tropical Africa, Iceland, Nova Zembla, Greenland, Central China, Japan, India, Siam, Singapore, Abyssinia, Australia.

TETMEMORUS GRANULATUS, *Ralfs in Ann. & Mag. Nat. Hist.* ser. 1. xiv. (1844) 257, t. 8. f. 2.

Sarawak, Matang, pipe-track, among *Batrachospermum* in ditch. March. 4412.

Distrib. Europe, N. America, Sandwich Islands, Iceland, Greenland, China, Ceylon, Java, Australia, Azores, W. Indies.

EUASTRUM BINALE, *Ehrenb.*, var. RETUSUM, *West, in Journ. Roy. Micr. Soc.* (1892) 723, t. 9. f. 6.

Sarawak, Matang, pipe-track, among *Batrachospermum* in ditch. March. 4412. 25 × 18·3 μ.

Distrib. Europe, Faeroes, Iceland, Nova Zembla, Spitzbergen, Greenland, Siberia, India, Ceylon, Siam, Singapore, Australia, New Zealand, Madagascar, Central & E. Africa, Sandwich Islands, United States, W. Indies, Brazil, Patagonia.

EUASTRUM GNATHOPHORUM, *W. & G. S. West in Journ. Linn. Soc., Bot.* xxxiii. (1897) 160, t. 9. ff. 3 & 4.

Sarawak, Matang, 700′, under waterfall. March. 4404 *b*.

Distrib. Singapore, Ceylon.

EUASTRUM SINUOSUM, *Lenorm. ex Ralfs, Brit. Desm.* 85, t. 13. f. 5 *a–d*.

Sarawak, Matang, 700′, under waterfall. March. 4404 *b*. 60×34×24 μ. A form approaching var. REDUCTUM.

Distrib. Europe, Sandwich Islands, Faeroes, India, Ceylon, Burma, Siam, Singapore, Java, Australia, New Zealand, Central Africa, United States, Guiana, Brazil.

EUASTRUM SINUOSUM, var. REDUCTUM, *W. & G. S. West in Journ. Bot.* xxxv. (1897) 83.

Sarawak, Matang, 1000′, on damp wood. March. 4406. 56×5×29 μ.

Distrib. England, Ireland, Ceylon, Singapore, W. Africa.

MICRASTERIAS TRUNCATA, *Bréb.*, var. SEXLOBATA, *West*, var. nov. Semicellulis trilobatis, 18–19 μ trans lobos laterales ; incisuris lateralibus apertis, 10 μ altitudine ; polis convexis, 36 μ trans lobum apicalem. Membrana punctulata. Minor quam forma typica. 61×45 μ.

Sarawak, Matang, 700′, under waterfall. March. 4404 *b*.

The lateral lobes are quite entire, but the whole outline is that of *M. truncata*.

COSMARIUM AURICULATUM, *Reinsch, Contrib. Alg. Fung.* 83, t. 14. f. 5.

Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819. 141×41 μ.

Distrib. Germany, India.

COSMARIUM BLYTTII, *Wille, Vid. Selsk. Forhandl. Christiania*, n. II. 25, t. 1. f. 7 (1880).

Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819.

Distrib. Tropical Africa, Greenland, Central China, Ceylon, Australia, New Zealand, Madagascar, United States.

COSMARIUM CUCURBITA, *Bréb. in Desmaz. Cr. de Fr.* ed. 1. n. 1103, ed. 2. n. 503.

Sarawak, Matang, pipe-track, among algæ in ditch. March. 4412, 4113. 28·3×16 μ.

Distrib. Europe, N. America, Singapore, Australia, W. Africa, W. Indies, Faeroes, Greenland.

COSMARIUM HAMMERI, *Reinsch, Algen u. von Franken*, iii. t. 10. f. 1 (sub *Didymidio*) excl. *C. octogibboso*, Reinsch.

Sarawak, Matang, 1000′, pipe-track, on damp wood. March. 4406. 38–48 × 27·5–31·5 μ.

Distrib. Europe, N. America, Burma, Sumatra, Singapore, India, Ceylon, New Zealand, Australia, Central & E. Africa, Brazil, Paraguay, Patagonia.

COSMARIUM IMPRESSULUM, *Elf. Anteckninger om finska Desmidiæ*, t. 13. f. 9.

Melalap, 800′, on log in river. Jan. 2767. 20 × 17 μ, a small form with undulations less pronounced than usual.

Distrib. (of type). Europe, Faeroes, Siberia, Japan, India, Australia, New Zealand, Azores, W. & E. Africa, United States, Brazil, Argentina, Patagonia.

COSMARIUM LÆVE, *Rabenh. Fl. Eur. Alg.* iii. 161 (1868).

Melalap, 800′, on log in river. Jan. 2767. 20 × 16·5 μ, a relatively wide form. Sarawak, Matang, 1000′, on damp wood. March. 4406. 24 × 15·6 μ.

Distrib. Europe, tropical Africa, India, Ceylon, Burma, Siam, Australia, Madagascar, Azores, United States, W. Indies, Ecuador, Uruguay, Argentina, Patagonia, Faeroes, Nova Zembla.

COSMARIUM MARGARITATUM, *Roy & Biss.*, f. MINOR, *W. & G. S. West in Journ. Bot.* xxxv. (1897) 121.

Tenom, 700′, among submerged algæ in ditch. Jan. 3080. 64–66 × 53–55 μ.

Distrib. Europe, Greenland, Ceylon, Singapore, W. & Central Africa, United States, W. Indies, Brazil.

COSMARIUM MINIMUM, *W. & G. S. West, in Trans. Linn. Soc.* ser. 2. *Bot.* v. (1895) 58, t. 8. f. 10.

Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819. 10 × 9·5 μ.

Distrib. Ceylon, Madagascar, W. Africa.

COSMARIUM PSEUDONITIDULUM, *Nordst.*, var. VALIDUM, *W. & G. S. West, Brit. Desmidiaceæ*, ii. 196, pl. 63. ff. 27–30 (1905).

Tenom, among *Azolla* in ditch. Jan. 2816. 51 × 43 μ.

Distrib. Great Britain, Norway, Ceylon, India, Singapore, Azores, W. Africa.

*COSMARIUM RENIFORME, *Arch. in Journ. Bot.* xii. (1874) 92.

Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Feb. 4211. A form 48 × 41 μ.

Distrib. Europe, N. & S. America, Faeroes, Greenland, Spitzbergen.

*COSMARIUM SPECIOSUM, *Lund.*, var. ROSTAFINSKII, *W. & G. S. West, Brit. Desmidiaceæ*, iii. 251, t. 89. ff. 8–10 (1908).

Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Feb. 4211. 40×28 μ.

Distrib. W. Yorkshire, Perth, Galicia in Austria, United States.

COSMARIUM SUBSPECIOSUM, *Nordst.*, var. VALIDIUS, *Nordst. Alg. Småsak.* iv. 160; *Fr. Wat. Alg. N.Z.* 49, t. 5. f. 10.

Tenom, among submerged plants in ditch. Jan. 3080. 81·5×5·5 μ, 86×60 μ.

Distrib. Europe, New Zealand, Patagonia, Madagascar, Manchuria, United States.

STAURASTRUM APICULATUM, *Bréb. Liste*, 142, t. 1. f. 23.

Sarawak, Matang, pipe-track, among algæ in peaty water. March. 4413.

Distrib. Europe, United States, Japan, Siam.

STAURASTRUM DEJECTUM, *Bréb. in Linnæa*, xiv. (1840) 227.

Sarawak, Matang, pipe-track, among algæ in peaty water. March. 4413.

Distrib. Europe, N. America, Siberia, Faeroes, Iceland, Greenland, Japan, India, Australia, New Zealand, Ceylon, E. Africa, Mongolia, Central China.

STAURASTRUM PSEUDOTETRACERUM, *W. & G. S. West in Trans. Linn. Soc.* ser. 2. *Bot.* v. (1895) 79, t. 6. f. 39.

Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819. A small form with somewhat reduced processes.

Distrib. Madagascar, Ceylon, Azores, Siam, United States.

STAURASTRUM PUNCTULATUM, *Bréb. Liste*, 129, n. 24, t. 1. f. 16.

Sarawak, Matang, pipe-track, among *Batrachospermum* in ditch. March. 4412.

Distrib. Europe, Greenland, Spitzbergen, N. & S. America, Burma, New Zealand.

PLEUROCOCCOIDEÆ.

PLEUROCOCCUS VULGARIS, *Meneg. Nostoch.* 38, t. 5. f. 1 (figuræ inferiores, superiores huc non pertinent).

Sarawak, Matang, on *Begonia* leaves. March. 3141. 5–5·6 μ.

Distrib. Europe.

PLEUROCOCCUS RUFESCENS, *Bréb. in Rabenh. Fl. Eur. Alg.* iii. 28.

Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819. 13·3–20 μ.

Distrib. Europe.

*PLEUROCOCCUS RUFESCENS, var. VIRIDIS, *West*, var. nov.; cellulis omnibus viridibus.

Kinabalu, 13,000′, summit plateau, on rock under water. Feb. 4212. Sarawak, Matang, 1000–2800′, on leaves of trees. March. 3140. Matang, 1500′, on *Begonia* leaves. March. 3141. Matang, on pipe-track, among algæ in peaty water. March. 4413. Cells up to 25 μ.

PEDIASTRUM TETRAS, *Ralfs, Ann. & Mag. Nat. Hist.* ser. 1. xiv. (1844) 469, t. 12. f. 4.

Tenom, 700′, among *Naias*, in stagnant pool. Jan. 2819. Tenom, 700′, among floating plants in ditch. Jan. 2838.

Distrib. Europe, N. & S. America, Sandwich Islands, Porto Rico, Siberia, tropical Africa, Madagascar, Ceylon.

SCENEDESMUS BIJUGATUS, *Kütz. Syn. Diat.* 607.

Tenom, among *Naias* in stagnant pool. Jan. 2819. Sarawak, Matang, on pipe-track, among algæ in peaty water. March. 4413.

Distrib. Cosmopolitan.

SCENEDESMUS ACUTIFORMIS, *Schröder, in Forschungsb. Biol. Stat. Plön*, v. (1897) 17, t. 2. f. 4.

Sarawak, Matang, on pipe-track, among algæ in peaty water. March. 4413.

Distrib. Tropical Asia, Europe.

SCENEDESMUS OBLIQUUS, *Kütz. Syn. Diat.* 609.

Tenom, among *Naias* in stagnant pool. Jan. 2819.

Distrib. Cosmopolitan.

ANKISTRODESMUS FALCATUS, *Ralfs*, var. ACICULARIS, *G. S. West, Brit. Freshw. Alg.* 223 (1904).

Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819. Sarawak, pipe-track to Matang, among algæ in peaty water. March. 4413.

Distrib. Tropical Asia, Europe.

OOCYSTIS ELLIPTICA, *West in Journ. Micr. Soc.* xii. (1892) 736, t. 10. f. 56.

Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819. Sarawak, Matang, 1000′, on damp wood. March. 4406.

Distrib. Europe.

OOCYSTIS SOLITARIA, *Wittr. in Wittr. et Nordstedt, Alg. Aq. Dul. Exs.* n. 244. ff. 1–5.

Melalap, 800′, on log in rivers. Jan. 2767. 32 × 20 μ.

Distrib. Sweden, S. America, Porto Rico, Siberia, tropical Africa.

TETRÆDRON MININUM, *Hansg. in Hedwigia*, xxvii. (1888) 131.
Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819.
Distrib. Europe, N. America, Kerguelen, Afghanistan, tropical Africa, Madagascar.

HETEROKONTÆ.

CONFERVALES.

BUMILLERIA PUMILA, *West & G. S. West, in Journ. Bot.* xli. (1903) 77, 446. ff. 22 & 23.
Matang, 1000′, on damp wood. March. 4406. 4–5 μ broad.
Distrib. England.

BACILLARIEÆ.

RAPHIDIEÆ.

COCCONEMA GASTROIDES, *West & G. S. West in Trans. Bot. Soc. Edin.* xxiii. (1905) 36.
Tenom, 700′, among *Azolla* in stagnant pool. Jan. 2816. Tenom, 700′, among sodden leaves in forest. Jan. 2815.
Distrib. Europe, United States.

COCCONEMA PROSTRATUM, *G. S. West, Brit. Freshw. Algæ*, 299 (1904).
Tenom, 700′, among *Azolla* in stagnant pool. Jan. 2816.
Distrib. Europe, United States.

COCCONEMA AFFINE, *West & G. S. West, in Trans. Bot. Soc. Edin.* xxiii. (1905) 36.
Melalap, 800′, on log in river. Jan. 2767.
Distrib. Europe, United States.

COCCONEMA ÆQUALIS, *G. S. West, in Ann. S. Afr. Mus.* ix. (1912) 73.
Syn. *Cocconema subæqualis*, Grun.
Tenom, 700′, among sodden dead leaves in forest. Jan. 2815.
Distrib. Europe.

NAVICULA ANGLICA, *Ralfs, in Pritch. Inf.* ed. 4, 900.
Tenom, 700′, among sodden dead leaves in forest. Jan. 2815.
Distrib. Europe, Jamaica, tropical Africa, United States.

NAVICULA BREBISSONII, *Kütz. Bacill.* 93, t. 3. f. 49, t. 30. f. 39.
Tenom, 700′, in ditch after rain. 2911. Sarawak, Matang, pipe-track, among algæ in peaty water. March. 4413.
Distrib. Europe, United States.

NAVICULA DICEPHALA, *W. Sm. Brit. Diat.* i. 53, t. 17. f. 157.
Sarawak, Matang, pipe-track, among algæ in peaty water. March. 4413.
Distrib. Great Britain, Europe, tropical Africa, United States.

NAVICULA ELLIPTICA, *Kütz. Bacill.* 98, t. 30. f. 55 (1844).
Tenom, 700′, in water oozing from rock. Jan. 2935.
Distrib. Europe, N. America, tropical Africa.

NAVICULA ELLIPTICA, var. OBLONGELLA, *Van Heurck, Syn. Diat.* 92, t. 10. f. 12.
Tenom, 700′, in water oozing from rock. Jan. 2935.
Distrib. Europe.

*NAVICULA GASTRUM, *Donk. Brit. Diat.* 22, t. 3. f. 10.
Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Feb. 4211.
Distrib. Europe, N. America, tropical Africa.

NAVICULA GIBBA, *Kütz. Bacill.* 98, t. 28. f. 70.
Tenom, 700′, among *Ricciocarpus* in stagnant pool. Jan. 2657. Among *Naias* in stagnant pool. Jan. 2819. Among submerged algæ in ditch. Jan. 3080. Among floating plants in ditch. Jan. 2838. Sarawak, Matang, 1000′, on damp wood. March. 4406.
Distrib. Europe, N. & S. America, Ceylon.

NAVICULA IRIDIS, *Ehrenb. Verbr.* 130, t. 4. I. f. 2.
Tenom, 700′, on damp ground. Jan. 2936. Tenom, 700′, on submerged plants in ditch. Jan. 3080.
Distrib. Europe, S. America, United States, Ceylon.

NAVICULA MESOLEPTA, *Ehrenb. Amer.* t. 4. II. f. 4.
Tenom, 700′, on roadside ditch, after rain. Jan. 2911.
Distrib. Europe, America, tropical Africa.

*NAVICULA VIRIDULA, *Kütz. Syn. Diat.* t. 1. f. 12 (1833).
Kinabalu, summit, 12,500′, where Kadamaian flows over granite. Feb. 4211. Sarawak, Matang, 1000′, on damp wood. March. 4406.
Distrib. Europe, United States.

NAVICULA CRYPTOCEPHALA, *Kütz. Bacill.* 95, t. 3. f. 26.
Tenom, 700′, among submerged plants in ditch. Jan. 3080. Tenom, 700′, in puddles after heavy rain. Jan. 2839. Senagong, 1000′, among dead leaves in stream. Jan. 2963.
Distrib. Europe, tropical Africa United States.

NAVICULA CRYPTOCEPHALA, var. VENETA, *Van Heurck, Syn. Diat.* t. 8. f. 10 (1885).

Tenom, 700′, among submerged algæ in ditch. Jan. 3080.

Distrib. Belgium ; United States.

VANHEURCKIA RHOMBOIDES, *Bréb.*, var. SAXONICA, *W. & G. S. West, Alg. Fl. of Yorks.* 1901.

Sarawak, Matang, 1000′, on damp wood. March. 4406. Sarawak, pipe-track, among algæ in peaty water. March. 4413.

Distrib. Europe, United States, Ceylon.

GYROSIGMA SCALPROIDES, *Rabenh. Fl. Eur. Alg.* 241.

Senagong, 1000′, on dead leaves in river. Jan. 2963.

Distrib. Europe.

GYROSIGMA ATTENUATUM, *Rabenh.*, var. SCALPRUM, *O. Kuntze.*

Tenom, 700′, among submerged algæ in ditch. Jan. 3080.

Distrib. Europe, United States.

*GOMPHONEMA ANGUSTATUM, *Kütz. Bacill.* 83 (1844).

Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Feb. 4211. Sarawak, Matang, 1000′, on damp wood. March. 4406.

Distrib. Tropical Africa, Europe.

GOMPHONEMA CONSTRICTUM, *hrenb.*, var. CAPITATUM, *Van. Heurck, Syn. Diat., Atl.* t. 23. f. 7.

Tenom, 700′, among submerged algæ in ditch. Jan. 3080.

Distrib. British Isles, Europe, United States.

GOMPHONEMA EXIGUUM, *Kütz. Bacill.* 84, t. 30. f. 58.

Tenom, 700′, among submerged algæ in ditch. Jan. 3080.

Distrib. Europe, tropical Africa.

GOMPHONEMA GRACILE, *Pritch. Inf.* ed. 4. 217, t. 18. f. 3.

Tenom, 700′, among sodden dead leaves in forest. Jan. 2815.

Distrib. Europe, W. Indies, Central America, tropical Africa, United States.

GOMPHONEMA OLIVACEUM, *Kütz. Bacill.* 85, t. 7. ff. xiii. & xv.

Tenom, 700′, among sodden dead leaves in forest. Jan. 2815.

Distrib. Europe, N. Africa, United States.

GOMPHONEMA INTRICATUM, *Kütz. Bacill.* 87, t. 9. f. 4.
Tenom, 700′, among submerged algæ in ditch. Jan. 3080.
Distrib. Europe, tropical Africa, United States.

ACHNANTHES EXILIS, *Kütz. Alg. Aq. Dulc.* n. 12 (1833).
Sarawak, Matang, 2800′, on *Sphagnum*. March. 4411.
Distrib. Europe, Abyssinia, United States.

ACHNANTHES LINEARIS, *Grun. in Cleve et Grun. in Sv. Vet.-Akad. Handl. Stockh.* xvii. (1880) n. 2. p. 23.
Melalap, 800′, on log in river. Jan. 2767.
Distrib. Europe, tropical Africa, Ceylon.

PSEUDORAPHIDIEÆ.

EPITHEMIA ZEBRA, *Kütz. Bacill.* 34, t. 5. f. 12. *b*, & t. 20. f. 5.
Tenom, 700′, on damp ground. Jan. 2936. Sarawak, Matang, 1000′, on damp wood. March. 4406.
Distrib. Europe. United States.

EPITHEMIA ZEBRA, var. PROBOSCIDEA, *Grun. in Zool.-bot. Ges. Wien, Verhandl.* xii. (1862) 328, t. 6. f. 5.
Tenom, 700′, on roadside ditch after rain. Jan. 2911.
Distrib. Europe.

EPITHEMIA GIBBERULA, *Kütz.*, var. PRODUCTA, *Grun. in Zool.-bot. Ges. Wien, Verhandl.* xii. (1862) 330, t. 6. f. 9.
Tenom, 700′, among sodden dead leaves in forest. Jan. 2935.
Distrib. Europe, America.

*EUNOTIA LUNARIS, *Grun. in Van Heurck, Syn. Diat.* t. 35. ff. 3–4, 6 A.
Tenom, 700′, among *Ricciocarpus* in stagnant pool. Jan. 2657. Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Feb. 4211. Sarawak, Matang, 1000′, on damp wood. March. 4406.
Distrib. Europe, tropical Africa, United States; Ceylon.

EUNOTIA GRACILIS, *Rabenh. Fl. Eur. Alg.* i. 72.
Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819.
Distrib. Europe and America; Ceylon.

Eunotia pectinalis, *Rabenh. Fl. Eur. Alg.* i. 73.
Tenom, 700′, among *Naias* in stagnant pool. Jan. 2919.
Distrib. Europe, tropical America, United States; Ceylon.

*Eunotia prærupta, *Ehrenb. in Ber. Berl. Akad.* (1841) 414.
Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Feb. 4211.
Distrib. N. Europe and Iceland; N. & S. America; New Zealand.

*Eunotia majus, *Rabenh. Fl. Eur. Alg.* i. 72.
Tenom, 700′, on roadside ditch, after rain. Jan. 2911. Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Feb. 4211. Sarawak, Matang, pipe-track, among algæ in peaty water. March. 4413.
Distrib. Europe, Ceylon.

Fragilaria capucina, *Desmaz. Crypt. de France*, ed. 1, n. 453.
Tenom, 700′, on floating plants in ditch. Jan. 2829.
Distrib. Cosmopolitan in sweet (rarely salt) water.

Diatoma vulgare, *Bory, Dict. d'hist. nat., Bot.* t. 20. f. 1.
Tenom, 700′, on damp ground. Jan. 2936.
Distrib. Europe and N. Africa, United States.

*Surirella apiculata, *W. Sm. Brit. Diat.* xi. 88.
Kinabalu, Maraiparai spur, 7000′, on rotten wood. Feb. 4026.
Distrib. Europe, United States.

Surirella linearis, *W. Sm. Brit. Diat.* i. 31, t. 8. f. 58*a*.
Sapong, 800′, on damp place in young rubber plantation. Jan. 2716.
Distrib. Cosmopolitan.

Surirella ovalis, *Bréb. ex Kütz. Bacill.* 61, t. 30. f. 64.
Sarawak, Matang, 2600′, in mudhole in forest. March. 4409.
Distrib. Europe, United States.

Surirella ovalis, var. submamillata, *West, in Proc. Roy. Irish Acad.* xxxi. July 1912, n. 16, p. 38.
Tenom, 700′, roadside ditch after rain. Jan. 2911.
Distrib. Ireland.

Surirella robusta, *Ehrenb. in Ber. Berl. Akad.* (1840) 215.
Melalap, 800′, on log in river. Jan. 2767.
Distrib. Tropical Africa.

SURIRELLA ROBUSTA, var. SPLENDIDA, *Van Heurck, Syn. Diat.* t. 71. ff. 1–2.
Senagong, 1000, on stones and dead leaves in stream. Jan. 2963.
Distrib. Tropical Africa.

SURIRELLA SPIRALIS, *Kütz. Bacill.* t. 3. f. 64.
Sarawak, Matang, 700′, under waterfall. March. 4404 *b*.
Distrib. Europe, United States.

HANTZSCHIA AMPHIOXYS, *Grun. in Cleve & Grun. in Sv. Vet.-Akad. Handl. Stockh.* xvii. (1880) n. 2. p. 103.
Tenom, 800′, in puddle after rain. Jan. 2839. On roadside ditch after rain. Jan. 2911.
Distrib. Cosmopolitan.

NITZSCHIA PALEA, *W. Sm. Brit. Diat.* xi. 89.
Tenom, 700′, in water oozing from rock. Jan. 2935.
Distrib. Europe, Japan, tropical Africa, United States.

NITZSCHIA VERMICULARIS, *Grun. Arct. Diat.* p. 91.
Senagong, 1000′, on dead leaves in stream. Jan. 2963.
Distrib. Europe, United States.

NITZSCHIA OBTUSA, *W. Sm. Brit. Diat.* i. 39, t. 13. f. 109.
Tenom, 700′, on damp ground. Jan. 2936.
Distrib. Borneo (Labuan, *Kjellman, Cleve*) ; Europe, United States.

NITZSCHIA SIGMOIDEA, *W. Sm. Brit. Diat.* i. 38, t. 13. f. 104.
Tenom, 700′, on floating plants in ditch. Jan. 2838.
Distrib. Europe, Madeira, Japan, United States.

NITZSCHIA TRYBLIONELLA, *Hantzsch in Rabenh. Fl. Eur. Alg.* i. 147.
Tenom, 700′, on floating plants in ditch. Jan. 2838.
Distrib. Europe, tropical Africa, United States.

CRYPTORAPHIDIEÆ.

CYCLOTELLA OPERCULATA, *Kütz. Syn. Diat.* 7. f. 1.
Tenom, 790′, on floating plants in ditch. Jan. 2838.
Distrib. Europe, United States.

MYXOPHYCEÆ (Cyanophyceæ).

COCCOGONEÆ.

CHROOCOCCUS PALLIDUS, *Näg. Gatt. einz. Alg.* 46, t. 1. f. 2.

Sarawak, Matang, pipe-track, among *Batrachospermum* in ditch. March. 4412. Cells 7–8 μ broad.

Distrib. Europe, Africa, India.

CHROOCOCCUS MINOR, *Näg. Gatt. einz. Alg.* 47, t. 1 A. f. 4.

Sarawak, Matang, 1000′, on damp wood. 4406. Cells 3·6–4 μ broad. Matang, 700′, under waterfall. March. 4404 *b*. Cells 3·3 μ broad.

Distrib. Cosmopolitan.

*SYNECHOCOCCUS ÆRUGINOSUS, *Näg. Gatt. einz. Alg.* 56, t. 1 E. f. 1.

Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Feb. 4211. A broad form, 11–12 μ broad.

Distrib. Europe, Greenland, N. America, N. Africa, Australia.

*GLŒOCAPSA ARENARIA, *Rabenh. Fl. Eur. Alg.* ii. 39.

Kinabalu, summit plateau, 13,000′, on rock. Feb. 4213. Cells 5 μ broad.

Distrib. Europe and N. America.

GLŒOCAPSA ATRATA, *Kütz. Tab. Phyc.* i. t. 21. f. 4.

Sarawak, Matang, 1000′, on damp bank. March. 4401.

Distrib. Europe, India, Alaska.

*GLŒOCAPSA ÆRUGINOSA, *Kütz. Phyc. gen.* 174.

Kinabalu, summit plateau, 13,000′, on rock. Feb. 4213. Cells 2–3 μ broad.

Distrib. Europe, N. America, India, Greenland, Porto Rico.

*GLŒOCAPSA PUNCTATA, *Näg. Gatt. einz. Alg.* 51, t. 1 F. f. 6.

Kinabalu, summit plateau, 13,000′, on rock. Feb. 4213. Cells 1·5 μ, colonies 18–22 μ. Sarawak, Matang, 2500′, on stones in forest. March. 4407. Cells 1·6–1·8 μ broad, colonies 15–23 μ broad.

Distrib. Europe, India, tropical Africa.

*GLŒOCAPSA SANGUINOLENTA, *Kütz. Phyc. gen.* 174.

Kinabalu, summit plateau, rock under water. Feb. 4212.

Forma *minor*, cellulis rotundatis, sine tegumentis 2·5–3·5 (4 interdum) μ.

Kinabalu, summit, 12,500′, where Kadamaian streams over granite. Associated with *Stigonema panniforme*. March. 4211.

Distrib. (species). Europe and Greenland.

GLŒOCAPSA RUPESTRIS, *Kütz. Tab. Phyc.* i. t. 22. f. 2.

Sarawak, Matang, 1000′, on damp bank. March. 4401.

Distrib. Europe, N. America, Africa.

*GLŒOTHECE PALEA, *Forti, Tab. Phyc.* i. t. 20. f. 7.

Kinabalu, summit plateau, 13,000′, scraping on granite. Feb. 4213. Cells 3–4 μ broad, 7–8 μ long.

Distrib. Central Europe.

APHANOCAPSA ELACHISTA, *W. & G. S. West in Journ. Linn. Soc., Bot.* xxx. (1894) 276, t. 15. ff. 9, 10.

Tenom, 900′, on bark of trees. Jan. 2914. Cells 1·2–2 μ, colonies mostly 10–12 μ broad, crowded together. Sarawak, Matang, 1000′, on damp bank. March. 4401. Cells 1·6–2·2 μ broad.

Distrib. W. India, British Isles.

APHANOCAPSA ELACHISTA, *W. & G. S. West in Journ. Linn. Soc., Bot.* xxx. (1894) 276, t. 15. ff. 9, 10, forma *conferta*, f. nova. A cellulis subconfertis et confertis. Colonies 26–27 μ.

*APHANOTHECE SAXICOLA, *Näg. Gatt. einz. Alg.* 60.

Kinabalu, summit plateau, 12,500′, where Kadamaian streams over granite. Feb. 4211.

Distrib. Europe, Faeroes, Nova Zembla.

APHANOTHECE NIDULANS, *P. Richter in Botan. Notiser*, 1884, 122.

Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819.

Distrib. Europe.

*MICROCYSTIS MARGINATA, *Kütz. Tab. Phyc.* i. t. 8.

Tenom, 700′, in puddle after rain. Jan. 2839. Cells larger than usual, 3·3–5 μ, colonies 36–46 μ. Kinabalu, summit plateau, 13,000′, on rock. Feb. 4213. Cells 2·5–3·5 μ, colonies 30–70 μ.

Distrib. Europe, N. America, tropical Africa.

*MERISMOPEDIUM GLAUCUM, *Näg. Gatt. einz. Alg.* 55, t. 1 D. f. 1.

Tenom, 700′, among *Naias* in stagnant pool. Jan. 2819. Kinabalu, summit plateau, 13,000′, on rock. Feb. 4213. Cells after division 4 μ broad and almost pure blue in colour. Sarawak, Matang, on pipe-track, among *Batrachospermum* in ditch. March. 4412.

Distrib. Europe, India, Greenland, Azores, N. & S. America, Ceylon, N. Zealand, Fuegia, Australia, Hawaii, Mongolia.

HORMOGONEÆ.

OSCILLATORIA ANIMALIS, *Ag. in Flora*, x. (1827) 632.

Melalap, 800′, on log in river. Jan. 2767. Cells 3 μ broad, 1·5 μ long. Melalap, 800′, green slime on dug-out canoe. Jan. 2768. Cells 3·3 μ broad, 1·5–2·5 long. Kaningau, 1000′, in muddy stream, buffalo wallow and notched bamboo. Feb. 2964. Cells 3–4 μ broad, 2 μ long.

Distrib. Europe, N. America, Guadaloupe, tropical Africa, Australia.

OSCILLATORIA GEMINATA, *Gom. Monogr.* ii. 222, t. 7. f. 6.

Tenom, 700′, in puddle after rain. Jan. 2839. Cells 2·7–3·3 μ, subquadrate mostly.

Distrib. Europe, N. America, Siam, Sumatra, Central Africa.

OSCILLATORIA AGARDHII, *Gom. Monogr.* ii. 205.

Tenom, 700′, in puddle after rain. Jan. 2839. Cells 5 μ, subquadrate. Senagong, 1000′, on dead leaves in river. Jan. 2963. Cells 5–5·5 μ broad, subquadrate.

Distrib. N. and Central Europe.

OSCILLATORIA LIMOSA, *Ag. Disp. Alg. Suec.* 35 (1812).

Tenom, 2000′, on hill-rice field. Jan. 2867. Cells 14 μ broad. Tenom, 700′, on damp ground. Jan. 2936. Cells 16 μ broad, 5 μ long. Kaningau, 1000′, in muddy stream, buffalo wallow and notched bamboo. Feb. 2964. Cells 11–12 μ broad, 4 μ long. Sarawak, Matang, 1000′, on damp wood. March. 4406. Cells 12·5–13 μ broad. Matang, 2800′, on *Sphagnum*. March. 4411. 17 μ broad, a peculiar form with cells sometimes almost as long as broad.

Distrib. Europe, India, Africa, N. and S. America, Fuegia, Australia.

OSCILLATORIA NIGRA, *Vauch. Hist. des Conf.* 192, n. 3, t. 15. f. 4 (1803).

Tenom, 700′, among *Azolla* in stagnant pool. Jan. 2816. A narrow form 7·5 μ broad, cells subquadrate. Senagong, 1000′, on stones and dead leaves in stream. Jan. 2963. A similar form.

Distrib. Europe, N. America, India.

OSCILLATORIA PRINCEPS, *Vauch. Hist. des Conf.* 190, t. 15. f. 2 (1803).

Senagong, 1000′, on stones and dead leaves in stream. Jan. 2963. 31–32 μ broad, cells 3·5 μ long.

Distrib. Europe, N. & S. America, W. Indies, N. Africa, Ceylon, Sumatra, Siam, Java, Australia.

SPIRULINA SUBTILISSIMA, *Kütz. Tab. Phyc.* i. t. 38. f. 7.

Tenom, 700′, on sodden dead leaves in forest. Jan. 2815.

Distrib. Europe, Siberia.

PHORMIDIUM TENUE, *Gom. Monogr.* ii. 179, t. 4. ff. 23–25.

Tenom, 700′, on floating plants in ditch. Jan. 2838. 1·5 μ broad. Sarawak, Matang, 1000′, on damp wood. March. 4406. Up to 2·4 μ broad.

Distrib. Europe, N. America, Central Asia, Samoa, Franz Josef Land.

LYNGBYA ÆRUGINEO-CŒRULEA, *Gom. Monogr.* ii. 142, t. 4. ff. 1–3.

Melalap, 800′, green slime on dug-out canoe. Jan. 2768. 6–6·5 μ broad. Old Tenom, 900′, on native path. Jan. 2912. 5–6 μ broad. Tenom, 900′, on bark of trees. Jan. 2914. 4·4 μ broad, cells 3–3·5 long. Renagong, 2800′, on damp earth. Feb. 3942. Sarawak, Matang, 2800′, on *Sphagnum*. March. 4411. 6 μ broad.

Distrib. Cosmopolitan.

LYNGBYA GIBBSIÆ, *West*, sp. nov.

L. filamentis 5–6 μ crassis, cæspitosis et flexuosis; vaginis firmis, arctis, et hyalinis; cellulis diametro $1\frac{1}{2}$–$2\frac{1}{2}$-plo longioribus, nonnunquam subquadratis, non constrictis inter cellulas, cellula apicali rotundata.

Hab. Tenom, 700′, on bark of trees. Jan. 2914.

LYNGBYA LIMNETICA, *Lemm. in Bot. Centralbl.* lxxvi. (1898) 154.

Melalap, green slime on dug-out canoe. Jan. 2768. 0·8–0·9 broad, cells subquadrate. Tenom, 700′, in puddle after rain. Jan. 2839. 1 μ broad.

Distrib. Europe, Java, New Zealand, and Chatham Islands.

*LYNGBYA MUSCICOLA, *Zanard, Phyc. Indic. pugillus*, 31 (159), no. 68, t. 10 D. 1–2.

Kinabalu, Gurulau spur, 5000′, on damp earth. Feb. 4023. Sheath 16·5–20 μ, trichomes 13–14 μ, cells 4·5–6·5 long, sheaths smooth.

Distrib. Borneo (Sarawak, *Beccari*).

LYNGBYA PUTEALIS, *Mont. Ann. Sci. Nat.* 2 sér. *Bot.* xiii. (1840) 200.

Melalap, 700′, on log in river. Jan. 2767. 11·6 broad, cells 2–3 times longer.

Distrib. Ceylon, Antilles, Jamaica, S. America, Réunion.

LYNGBYA SUBTILIS, *West in Journ. R. Micr. Soc.* (1892) 741.

Tenom, 700′, among sodden dead leaves in forest. Jan. 2815. 1·6 μ broad, cells up to 3·5 μ long.

Distrib. N. Europe, Dominica, Sandwich Islands.

*SYMPLOCASTRUM CUSPIDATUM, *Forti, in De Toni, Syll. Alg.* v. 349.

Kinabalu, summit plateau, 13,000′, on rock. Feb. 4213. 2–2·5 broad, cells 1½–4 times longer.

Distrib. England, West Indies.

INACTIS HAWAIENSIS *Forti, in De Toni, Syll. Alg.* v. 357.

Sarawak, Matang, 1000′, on damp bank. March. 4401. Among *Calothrix fusca, Schizothrix hyalina*, &c. Sarawak, Matang, 2800′, on *Sphagnum*. March. 4411. Among *Hapalosiphon*.

Distrib. Sandwich Islands.

SCHIZOTHRIX FUSCESCENS, *Kütz. Phyc. gen.* 230.

Sarawak, Matang, 2800′, on *Didymocarpus* leaves. March. 3142. 2–2·5 broad, cells 2–4 times longer; 1–3 filaments in a sheath, usually 2.

Distrib. Europe, Central Africa, Australia.

*SCHIZOTHRIX RUPICOLA, *Filden, Am. Alg. Cent.* ii. n. 175.

Kinabalu, summit plateau, 13,000′, on rock under water. March. 4212. Cells subquadrate, 4·5 μ broad. Sarawak, Matang, 700′, under waterfall. March. 4404 *b*. Cells subquadrate, 3·5 μ broad.

Distrib. N. America.

SCHIZOTHRIX HYALINA, *Kütz. Sp. Alg.* 320.

Sarawak, Matang, 1000′, on damp bank. March. 4401. Matted in a felt-like manner; filaments usually 1 μ broad, cells subquadrate, generally 3 in a sheath, the latter often 13 μ broad. Associated with *Stigonema panniforme*. Matang, pipe-track, in ditch. March. 4410. Associated with *Calothrix epiphytica*.

Distrib. Europe, N. & S. America.

*MICROCOLEUS VAGINATUS, *Gom. in Journ. de Bot.* iv. (1890) 353.

Kinabalu, summit plateau, 13,000′, on rock. March. 4213. 4–5 μ broad, 4–6 μ long, sheath 55–65 μ broad. Sarawak, Matang, 200′, in ditch on bridle-path. March. 4405. Sarawak, Matang, 2800′, on *Didymocarpus* leaves. March. 3142. 3·5–4 μ broad, sheath 58–62 μ broad.

Another distinct form of *Microcoleus* was associated with this with only 2 to 3 filaments in the sheath, which latter was narrower, 16–20 μ in diameter, filaments not more than 3 μ broad and usually 2–3 (sometimes 4) times longer than broad ; it may represent an earlier stage.

Distrib. Cosmopolitan.

*MICROCOLEUS VAGINATUS, var. TENUIOR, *West*, var. nov. Vaginis trichomatibus regulariter angustioribus quam in forma typica, trich. 2·5–3 lat., 3–4 μ longit.

Kinabalu, summit plateau, on rock. Feb. 4213.

*DASYGLŒA AMORPHA, *Berk. Eng. Bot.* t. 2941 (1848).

Tenom, 2000′, on hill padi fields. Jan. 2867. Kinabalu, summit plateau, 13,000′, on rock. Feb. 4213.

Distrib. England, Ceylon, United States.

ANABÆNA MINUTA, *Borzì, Alghe della Papuasia*, 40.

Tenom, 700′, in puddle, after heavy rain. Jan. 2839. 2–3 μ broad. Sarawak, Matang, 700′, under waterfall. March. 4404 *b*. A form not more than 1·6 μ broad.

Distrib. New Guinea.

ANABÆNA VARIABILIS, *Kütz. Phyc. gen.* 210.

Sarawak, Matang, 1000′, on damp wood. March. 4406. Up to 6·5 μ broad.

Distrib. Europe, India, N. & S. America, Sandwich Islands.

MICROCHÆTE TENUISSIMA, *W. & G. S. West, in Journ. Linn. Soc., Bot.* XXX. (1894) 269, t. 14. ff. 7–11.

Sarawak, Matang, 1000′, on damp wood. March. 4406. 4 μ broad.

Distrib. Ireland ; Dominica.

MICROCHÆTE ROBUSTA, *Setch. & Gardn. Alg. N.W. Amer. in Univ. Cal. Pub.* 1903, 194.

Sarawak, Matang, 1000′, on damp wood. March. 4406. 18–20 μ broad, cells 12–12·5 μ broad, subquadrate.

Distrib. "Seattle, Wash.," N. America.

PLECTONEMA ORIENTALE, *West*, sp. nov.

P. filis intricatis, pseudo-ramis, vaginis luteo-aureis et crassis, 16–20 μ lat., trichomatibus æruginosis et lutescentibus, cellulis subquadratis, contentu granuloso, 12–13 μ lat.

Hab. Tenom, 700′, on bark and on "rentis." Jan. 2851.

Scytonema coactile, *Mont. in Kütz. Sp. Alg.* 305 (1849).

Sarawak, Matang, 1000′, in running water. March. 4403. Sheath 18–25 broad, filaments 15–17 μ broad, 10–20 μ long.

Distrib. Antilles, Bourbon; E. Indies.

Scytonema varium, *Kütz. Sp. Alg.* 307 (1849).

Sarawak, Matang, ditch on bridle-path, 200′. March. 4405. Sheath 10–12 μ broad, filament 5·5 μ broad.

Distrib. Borneo. Europe, N. & S. America, Sandwich Islands, Ceylon, Java, Tahiti, Australia.

Tolypothrix Setchellii, *Collins, Some perf. Algæ in Erytrea*, v. (1897) 95, t. 4. ff. 1–5.

Sarawak, Matang, 1000′, in running water. March. 4403. Sheath 6·6, filament 4·3 μ, cells quadrate.

Distrib. N. Africa.

Hapalosiphon intricatus, *West & G. S. West in Journ. Linn. Soc., Bot.* xxx. (1894) 271, t. 15. ff. 16–28.

Sarawak, Matang, 2800′, on *Sphagnum.* March. 4411. Filaments and branches from 4·5 to 6 μ broad, heterocysts from 4·2–4–5 broad and up to 9 μ long. Sarawak, Matang, in mud on pipe-track. March. 4402. 6·6 μ broad.

Distrib. Great Britain, Prussia, Dominica.

Hapalosiphon Baronii, *West & G. S. West in Trans. Linn. Soc.* ser. 2. *Bot.* ii. (1895) 85, t. 5. ff. 21–24.

Sarawak, Matang, 2800′, on *Sphagnum.* March. 4411. Filaments 8–10 μ broad. Matang, 2500′, on stones in forest. March. 4407. 7–10 μ broad.

Distrib. Madagascar, India, and Brazil.

*Stigonema minutum, *Hass. Brit. Freshw. Alg.* 230, t. 67. ff. 3, 4.

Kinabalu, summit plateau, 13,000′, on rock. Feb. 4213. A form with the branches not crowded; filaments 20–22 μ broad, cells 11·5–13 μ broad.

Distrib. Europe, India, Central Africa, N. & S. America, Sandwich Islands, Dominica, Java.

*Stigonema ocellatum, *Thur. Ess.* 380.

Kinabalu, summit plateau, 13,000′, on rock. Feb. 4213. Filaments 25–28 μ broad.

Distrib. Europe, N. America, Sandwich Islands, Dominica, Antilles, Japan, N. Caledonia, Australia, Tasmania.

*STIGONEMA PANNIFORME, *Kirchen. Algenfl. Schlesien*, 230.

Kinabalu, 12,500′, on granite, under Kadamaian. Feb. 4211. Kinabalu, summit plateau, 13,000′, on rock under water. Feb. 4212. Associated with *Glœocapsa sanguinolenta*. Sarawak, Matang, 1000′, on damp bank. March. 4401. Associated with *Schizothrix hyalina*. Sarawak, Matang, 2800′, on *Sphagnum*. March. 4411. Associated with *Hapalosiphon intricatus*. Sarawak, Matang, 700′, under waterfall. March. 4404 *b*.

Distrib. Europe, N. & S. America, Dominica, Hong Kong, Ceylon, Cape of Good Hope, Madeira, and Australia.

CALOTHRIX FUSCA, *Born. & Flah. Rev.* i. 364.

Sarawak, Matang, 1000′, on damp bank. March. 4401. Up to 11·5 μ broad; among *Stigonema panniforme* and *Schizothrix hyalina*.

Distrib. Europe, N. &. S. America, W. Indies, Fuegia, Hawaii, Africa, India and Ceylon.

CALOTHRIX EPIPHYTICA, *West & G. S. West, in Journ. Bot.* xxxv. (1897) 240.

Sarawak, Matang, 2800′, on *Sphagnum*. March. 4411. Filaments 7 μ broad; trichomes 5–5·5 μ broad; among *Stigonema panniforme*. Sarawak, Matang, pipe-track, in ditch. March. 4410. Filaments 5-7 μ broad; trichomes 3·5 μ broad; among *Schizothrix hyalina*.

Distrib. W. Africa, W. Indies, S. America, Iceland.

EXPLANATION OF THE PLATES.

PLATE 1.

Map of British North Borneo, giving localities of previous and present collections, with inset-tracing from Admiralty map of Kinabalu area.

[In the inset-tracing from the Admiralty map the Kadamaian river is given as the Kolupis. This agrees with Low (**2**. p. 9) and St. John (**7**. p. 369). Whitehead (**16**. p. 159), Little (**15**. p. 154), Haviland (**17**. p. 73), and Maxwell (**19**. p. 63), on the contrary, all refer to this river as the Kadamaian, and I have therefore followed the majority, calling that branch of the Tampussuk which rises on the granite core or highest portion of Kinabalu, Kadamaian, throughout this paper.]

PLATE 2.

Summit of Mount Kinabalu, by Capt. Learmonth, R.N.

PLATE 3.

Sigmatochilus kinabaluensis, Rolfe.

A. Flower. B. Labellum. C. Part of same. D. Column.
E. Anther. F. Pollen masses.

PLATE 4.

Dacrydium Gibbsiæ, Stapf.

A–C. Young strobili (B in longitudinal section). D. Two-seeded strobilus. E & F. Its components. G. Immature seed with fertile bract and ovuliferous scale, corresponding to E. H. Same with the seed removed. I. Same as H, in longitudinal section. J. Fruiting strobilus with supporting bracts. K. Same with most bracts removed. L–N. Same in various positions with all the bracts removed. O. Same in longitudinal section. P. Ovuliferous scale of L–N with the seed removed. *br.*, barren bracts; *f.br.*, fertile bract; *o.s.*, ovuliferous scale; *o.*, ovule; *s.*, seed.

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PLATE 5.

Fig. 1. Kinabalu, western view from Kotabelud. Cleared sandstone hills with the Tampussuk plains and river in the foreground. The Maraiparai spur is shown to the left, terminated by the peaked mountain of Saduk Saduk (Nokok).

Fig. 2. Kinabalu, zulap at Kamburangau, 7500′, showing *Gleichenia glauca* and *Dipteris conjugata* in the foreground with *Leptospermum flavescens* behind. *Patersonia* sp. roof the zulap.

PLATE 6.

Fig. 3. Kamburangau, 7500′, showing trees of *Dacrydium Gibbsiæ* and *Leptospermum flavescens.*

Fig. 4. Vegetation of mossy forest above Kamburangau, 7500–8000′. *Rhododendron Lowii* and *R. stenophyllum*, with *Calamus Gibbsianus*, *Arundinaria Gibbsiæ*, and epiphytic orchids in the foreground.

PLATE 7.

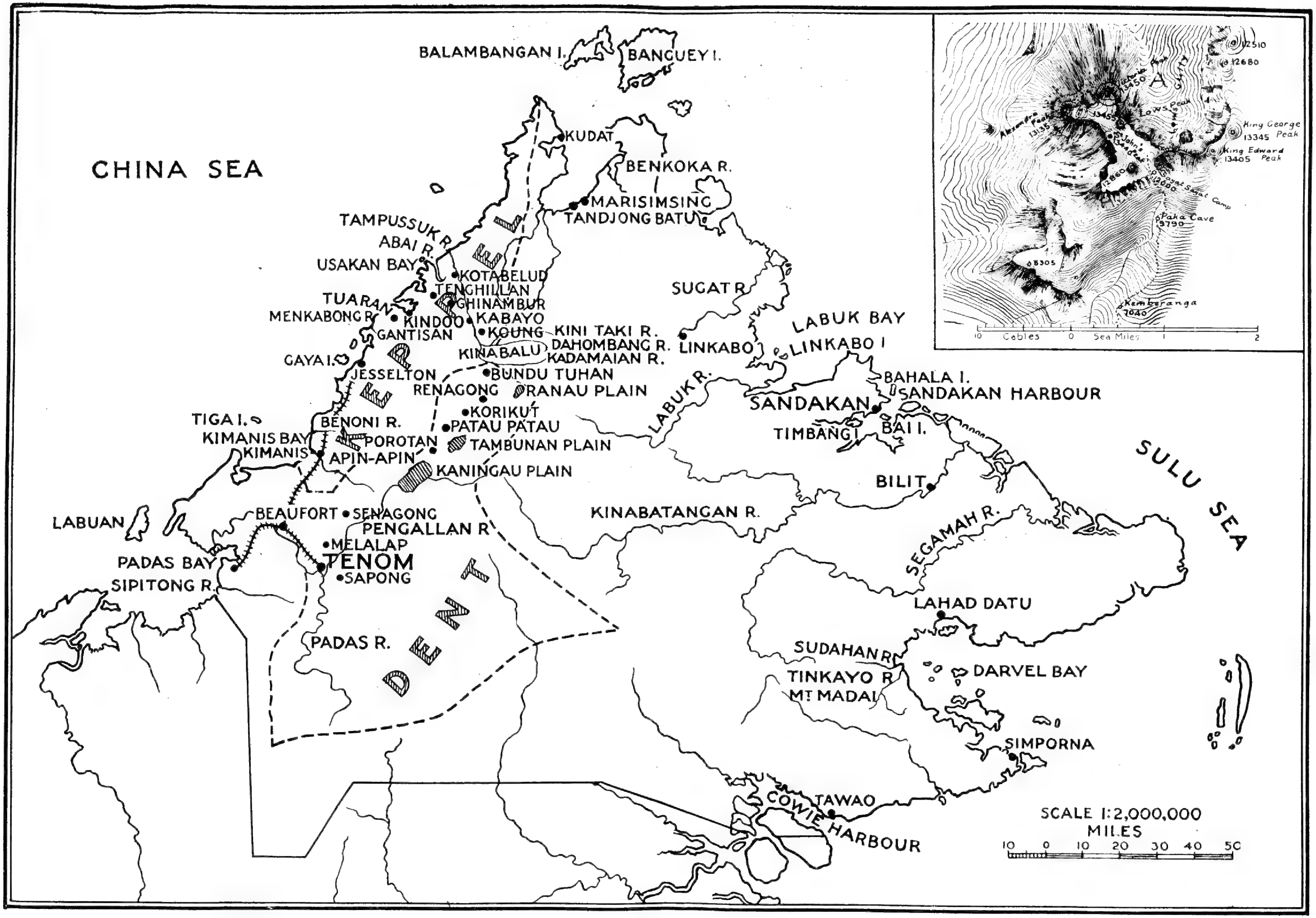
Fig. 5. Exposed granite core, 11,000′, showing dwarf sub-summit forest.

Fig. 6. Granite plateau, 13,000′, showing piled up slabs of granite. *Coprosma Hookeri* in the foreground.

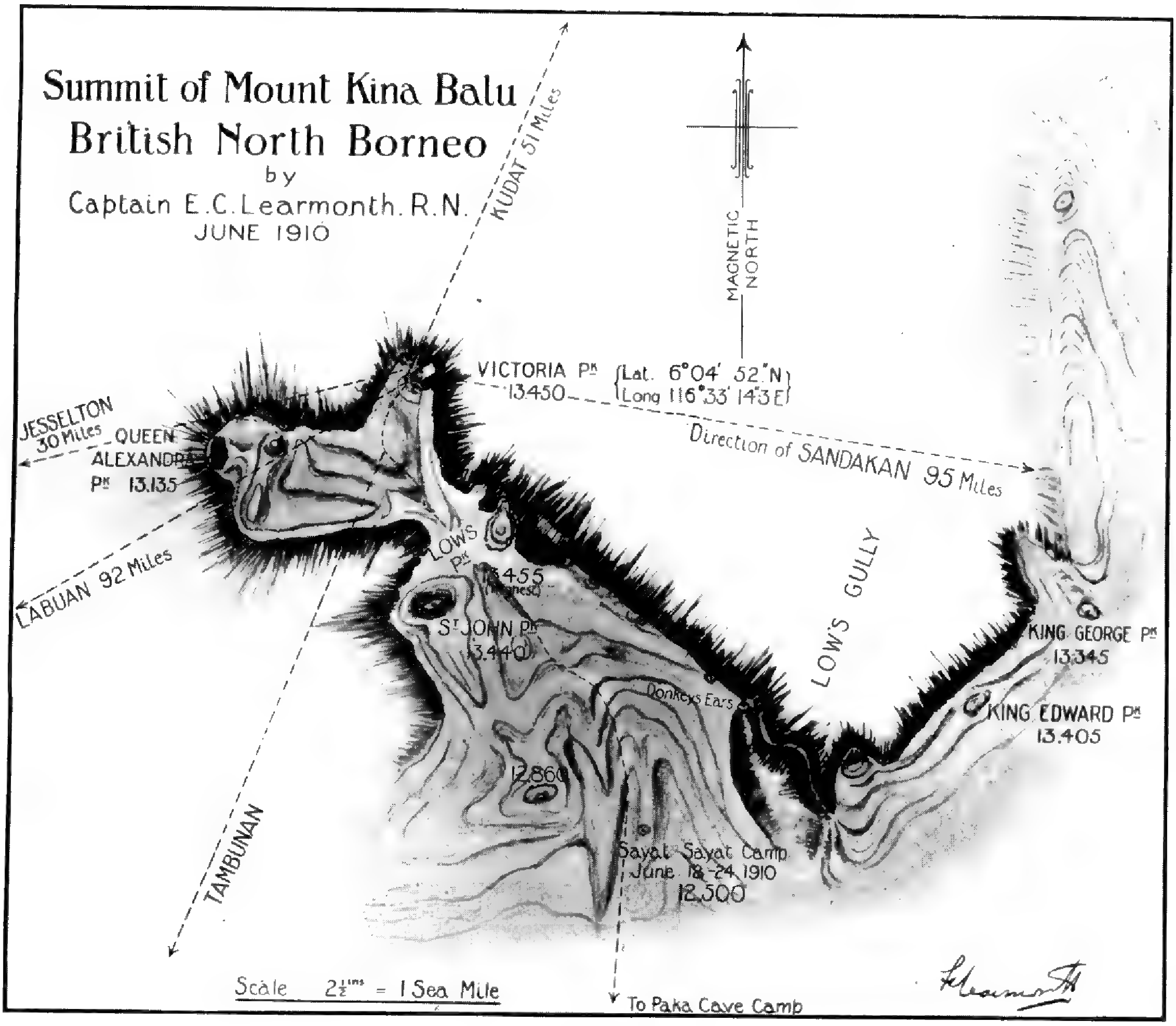
PLATE 8.

Fig. 7. Summit, 13,000′, one of the peaks.

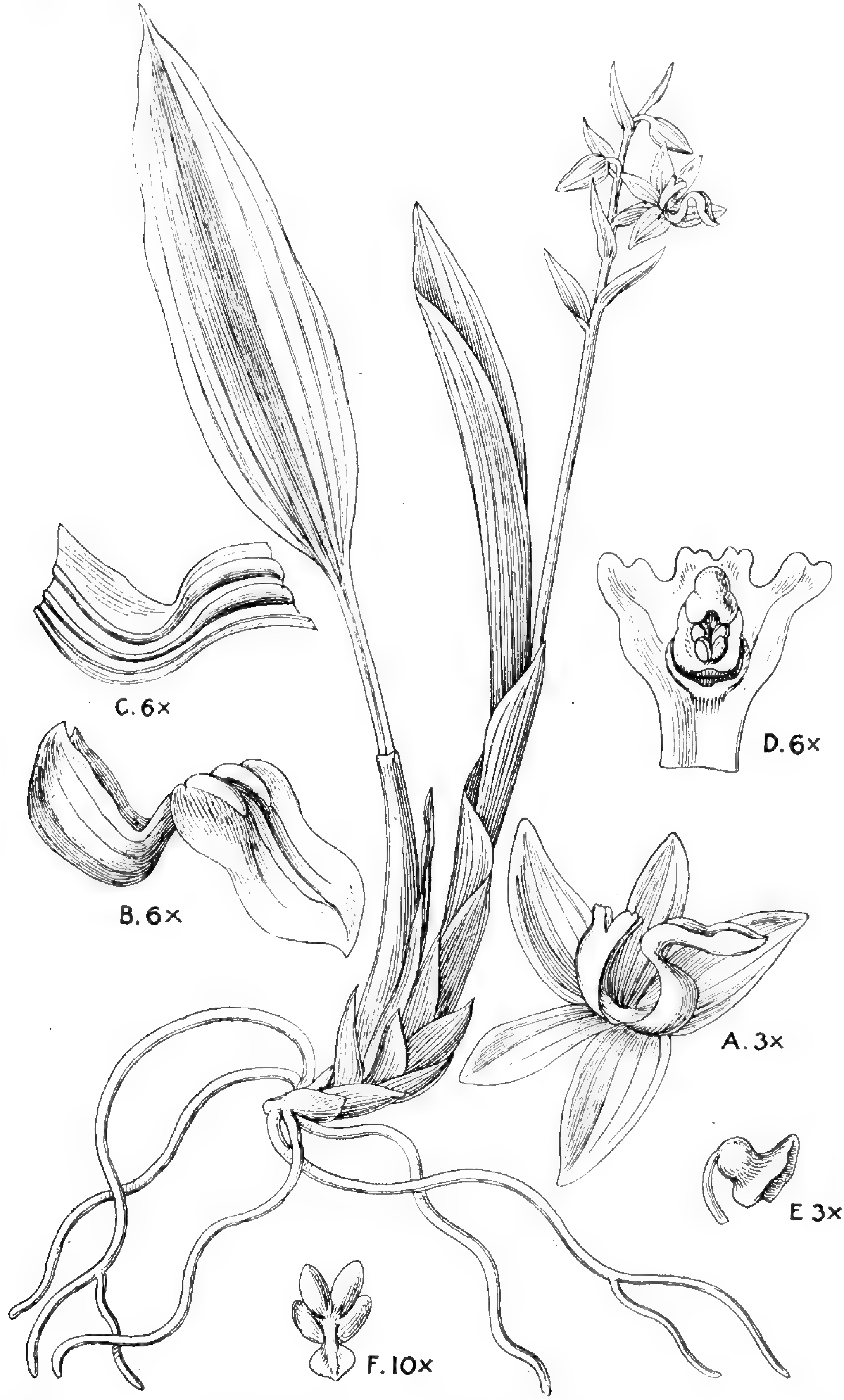
Fig. 8. Summit, looking across the edge of the abyss, from Low's Peak. Granite terrace to right. Discoloration of rock shown, but no vegetation.



BRITISH NORTH BORNEO.

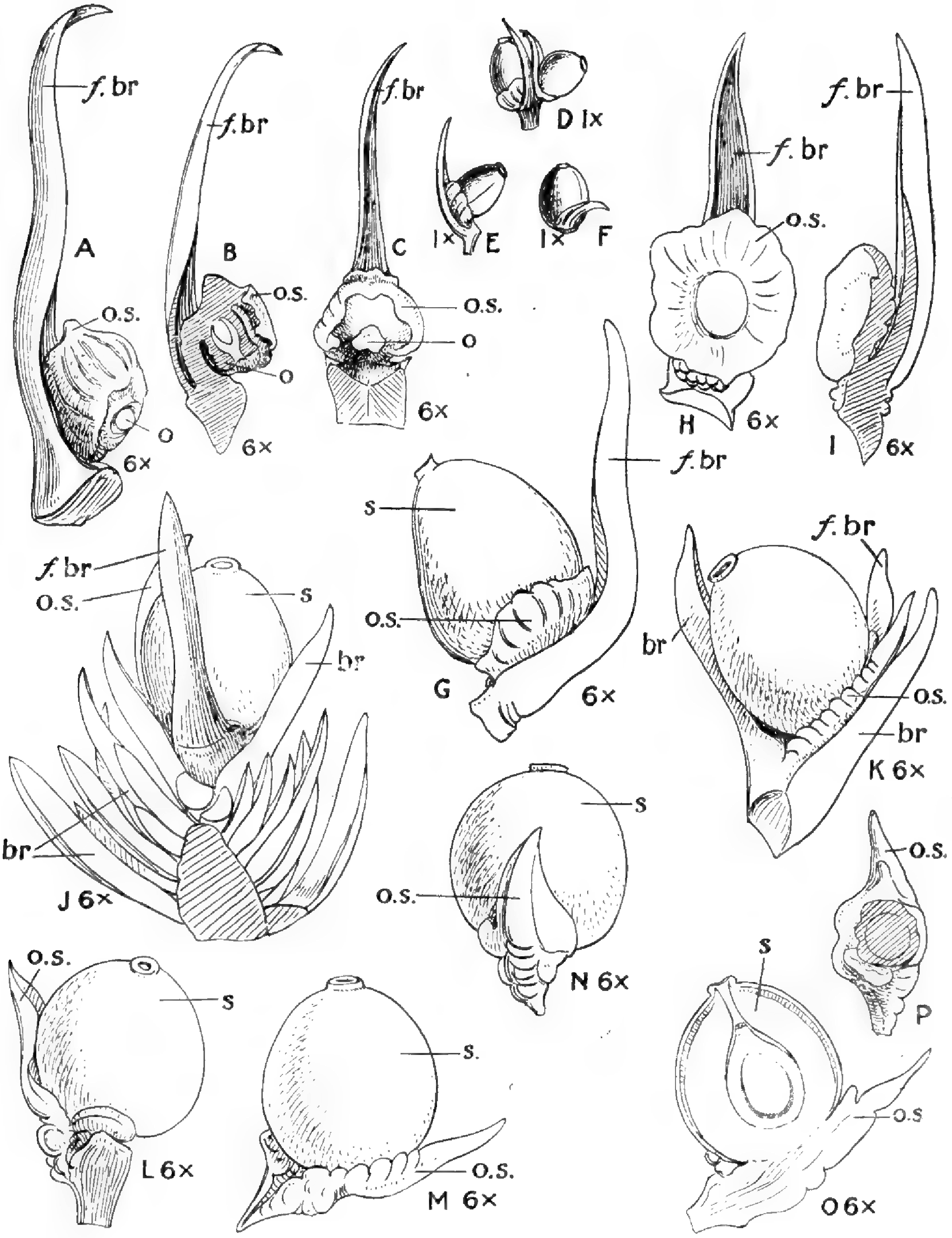

Summit of Mount Kina Balu
British North Borneo
by
Captain E.C. Learmonth. R.N.
JUNE 1910
KUDAT 51 Miles
MAGNETIC NORTH
VICTORIA Pk
13450
Lat. 6°04' 52" N
Long 116°33' 14.3 E
Direction of SANDAKAN 95 Miles
JESSELTON 30 Miles
QUEEN ALEXANDRA Pk 13.135
LABUAN 92 Miles
LOWS Pk
13.455
ST JOHN Pk
13.440
LOW'S GULLY
Donkeys Ears
KING GEORGE Pk
13.345
KING EDWARD Pk
13.405
12.860
Sayat Sayat Camp
June 18-24 1910
12.500
TAMBUNAN
Scale 2½ ins = 1 Sea Mile
To Paka Cave Camp

KINABALU.



M. Smith, del. Grout, sc.

SIGMATOCHILUS KINABALUENSIS, Rolfe.



O. S. del. Grout, sc.

DACRYDIUM GIBBSIÆ, Stapf.

FIG. 1.

FIG. 2.

Vegetation of British North Borneo.

FIG. 3.

FIG. 4.

Vegetation of British North Borneo.

FIG. 5.

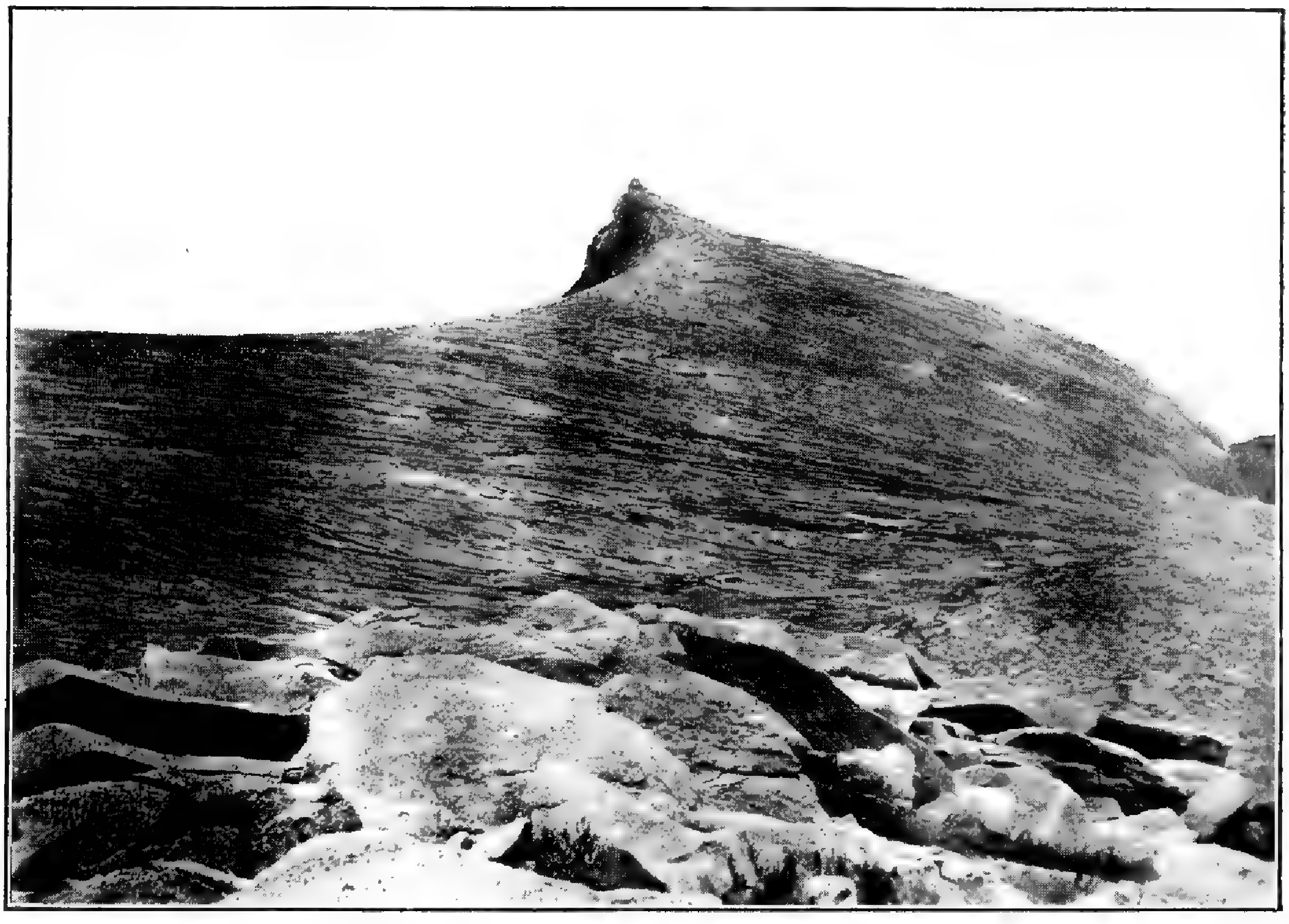


FIG. 6.

KINABALU.

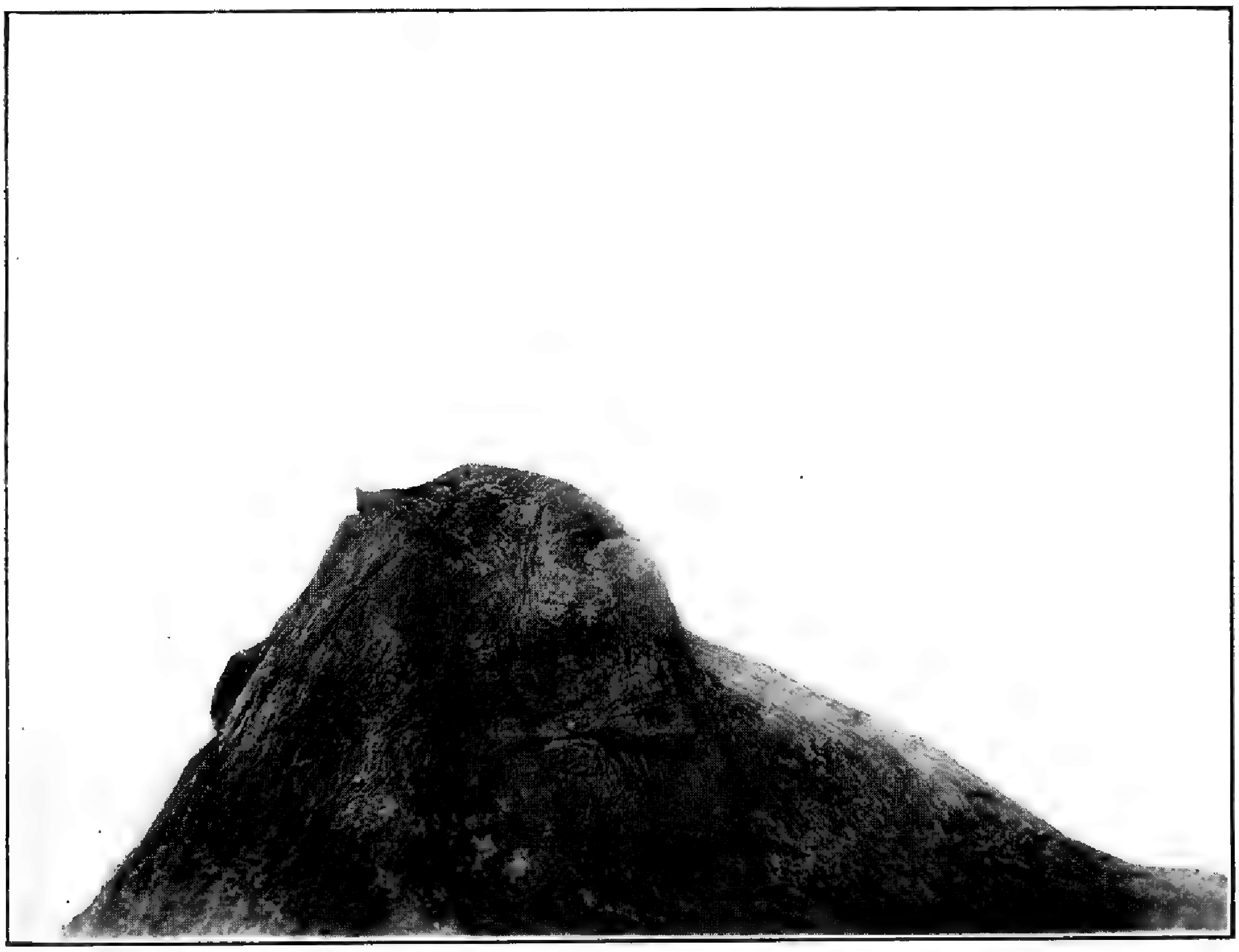


FIG. 7.

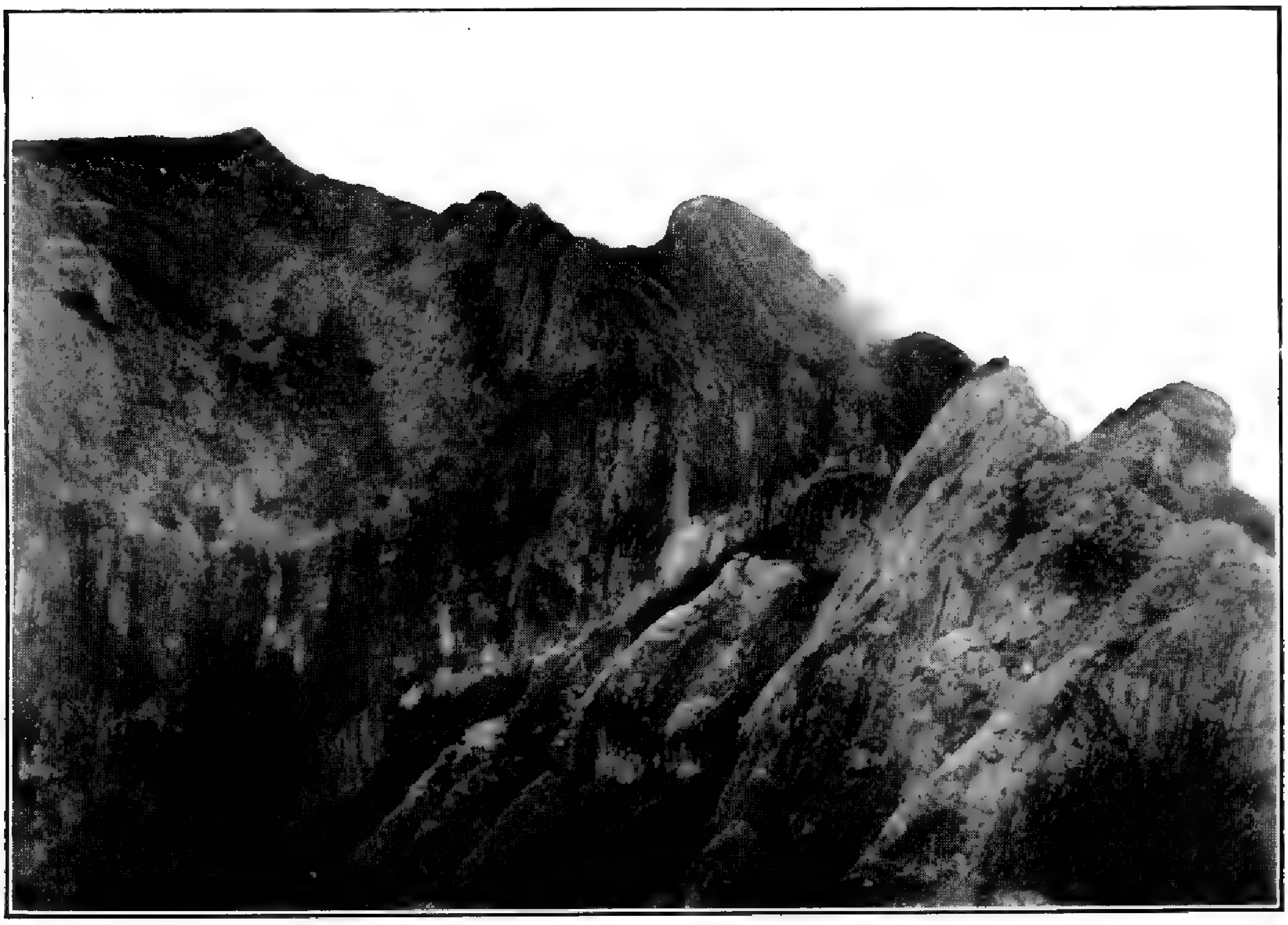


FIG. 8.

KINABALU.

JULY 14. Price 21s.

THE JOURNAL

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VOL. XLII. BOTANY. No. 286.

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A10

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The African Species of *Crotalaria*. By EDMUND G. BAKER, F.L.S.

(By permission of the Trustees of the British Museum.)

(PLATES 9–14.)

[Read 19th June, 1913.]

HISTORICAL INTRODUCTION.

THE genus *Crotalaria*, the name of which is derived from κρόταλον, a castanet, appears in Linnæus's 'Genera Plantarum,' ed. I. p. 218 (1737), but is there quoted as coming from Dillenius (Hort. Elth. 1732). The latter author figures two species, *Crotalaria perfoliatæ folio*, t. 102. fig. 122, and *Crotalaria lotifolio flore parvo variegato*, t. 102. fig. 121; the latter of these is a true *Crotalaria*, as the genus is now understood, but the former is generally considered to belong to the genus *Baptisia* and is *B. perfoliata*, R. Br., in Aiton, 'Hortus Kewensis,' ed. II. iii. p. 5 (1811). Linnæus in 'Species Plantarum' ed. I. pp. 714–716 (1753) has 13 species in *Crotalaria*, but before this date we find figures of plants belonging to this genus in the works of various botanists.

Hermann in 1687 (Hort. Acad. Lugd.-Bat.) figures four — *Crotalaria asiatica frutescens trifolia floribus luteis amplis* (p. 197) = *C. laburnifolia*, Linn.; *Crotalaria asiatica folio singulari verrucoso floribus cœruleis* (p. 199) = *C. verrucosa*, Linn.; *Crotalaria asiatica, folio singulari cordiformi, floribus luteis* (p. 201) = *C. retusa*, Linn.; and an American species, *Crotalaria hirsuta minor americana sagittata* (p. 203).

Rheede, in his 'Hortus Malabaricus,' ix. (1689), figures on t. 25 a plant he calls Tandale-Cotti, on t. 27 another, Nella-tandale-Cotti, and on t. 28 one, Wellia-tandale-Cotti; these three being now known as *C. retusa*, Linn., *C. laburnifolia*, Linn., and *C. quinquefolia*, Linn.

Plukenet, in his 'Almagestum,' p. 122, t. 169. fig. 5 (1696), has a *Crotalaria benghalensis foliis genistæ subhirsutis*, which is now known as *C. juncea*, Linn., whilst Sir Hans Sloane, in his 'History of Jamaica,' ii. t. 176. figs. 1, 2 (1725), depicts *Crotalaria trifolia fruticosa, foliis glabris, flore luteo viridi minore*, which is now known as *C. lotifolia* (*latifolia* sphalm.), Linn., and of which there is a specimen in the Sloane Herbarium at South Kensington, vol. vi. p. 5.

In 1737 J. Burman figured in his 'Thesaurus Zeylanicus,' tab. 34, *Crotalaria foliis solitariis ovato-acutis, caule sulcato*, which is *C. verrucosa*, Linn. In 1760 Linnæus published his 'Plantæ Africanæ Rariores,' where he has three species of *Crotalaria*, but they are not now retained in this genus; and the same may be said of the four species described by Bergius, in 1767, in his 'Descriptiones Plantarum ex Capite Bonæ Spei.'

The literature dealing with the African species of this genus is very extensive and very scattered, but it may be well briefly to refer to some of the more important publications.

In 1786, Lamarck, in his 'Encyclopédie Méthodique,' enumerates 37 species, dividing the genus into (*a*) *Feuilles simples*, (*b*) *Feuilles ternées ou digitées*; but several of the African species described are now placed in the genus *Rafnia*. One curious plant described by this author is *C. aspalathoides*, of which further material is desirable. In 1794 Thunberg enumerates 10 species in his 'Prodromus Plantarum Capensium,' but most of these are now likewise relegated to other genera. Dryander, in Aiton's 'Hortus Kewensis,' ed. I. vol. iii. p. 20, describes *C. pallida* and *C. axillaris*, the latter being an earlier name for *C. Hildebrandtii*, Vatke. In 1825, De Candolle published the second volume of his 'Prodromus.' He gives short descriptions of 137 species, among which are the following novelties from Africa:—*C. acuminata*, DC., *C. spartioides*, DC., *C. striata*, DC., *C. Perrottetii*, DC., *C. cylindrocarpa*, DC., *C. podocarpa*, DC., and *C. Willdenowiana*, DC. (= *C. genistoides*, Willd., *non* Lam.). The last species is an Indian plant and wrongly ascribed to the Cape. In the following year Desvaux [Ann. Sci. Nat. sér. 1 (1826), p. 407] described the genus *Clavulium*, but this is *C. laburnifolia*, Linn., one of the oldest species of the genus.

In 1832 Guillemin and Perrottet (Floræ Senegambiæ Tentamen) described the genus *Chrysocalyx*, which, following several other authors, I have considered as a section, characterised by having the petals generally the same length as the calyx, or shorter, and by the calyx being somewhat bilabiate and having very conspicuous bracteoles.

At the commencement of 1836 two elaborate works on Cape Leguminosæ appeared, written at one and the same time by different botanists without any communication with each other—Ernst Meyer's 'Commentationes de Plantis Africæ Australis,' and Ecklon and Zeyher's 'Enumeratio Plantarum Africæ Australis.' These were actually published so nearly at the same moment that it became a matter of controversy which should have priority. At a later period in 'Linnæa,' vol. xiii. (1839) pp. 449–543, Dr. Walpers attempted to consolidate into one enumeration all the Cape species published. Dr. Meissner, in Hooker's London Journal, vol. ii. (1843) p. 60, published Krauss's Cape Plants with considerable care and exactness. In the same volume there is a much more important paper, Bentham's "Enumeration of Asiatic and Central and South African Leguminosæ," where 140 species of *Crotalaria* are enumerated.

Bentham, following the lines previously indicated, first by Lamarck and subsequently by Wight and Arnott, arranged the species in groups characterised chiefly by foliage and habit. The following are his main divisions:—Series I. SIMPLICIFOLIÆ. *Folia simplicia nec in petiolo articulata.*

Series II. Foliolatæ. *Folia terna vel rarius solitaria vel omnia quina vel septena.*

A. Richard published his account of the Flora of Abyssinia in 1847, describing the 21 species occurring in that country; and in 1861–62 Harvey, in the 'Flora Capensis,' gives descriptions of 24 then known to occur in South Africa. Of these species, *C. spartioides*, DC., *C. lanceolata*, E. Meyer, *C. Burkeana*, Benth., *C. striata*, DC., *C. globifera*, E. Meyer, *C. platysepala*, Harvey, *C. capensis*, Jacq., and *C. natalitia*, Meissner, are now known to occur also north of the Equator. The number of species, therefore, restricted to South Africa is much smaller than in the genus *Indigofera*, where we have a large number endemic south of the Equator.

In 1862 Klotzsch described the collections of Peters in Peters's Mozambique Flora; and in 1871, in Prof. Oliver's 'Flora of Tropical Africa,' my father (J. G. Baker) described the 106 species then known to occur within the limits of the area of the Flora. Here for the first time the very rich collections made by Welwitsch, in Angola, are described. It may be interesting to note the distribution of these 106 species in the main geographical divisions adopted in the Flora; 33 of these occur in Upper Guinea, 39 in Nile Land, 52 in Lower Guinea, 19 in Mozambique District, and 4 in South Central Africa. Most of the species from Lower Guinea are from Angola; it therefore appears that Angola is richer in species than any other portion of Africa.

With comparatively trifling alterations I retain most of the species there described, the principal exceptions being that *C. cylindrica*, A. Rich., has as the older name to take the place of *C. tigrensis*, Baker; *C. Onobrychis*, A. Rich., is perhaps only a subspecies of *C. astragalina*, Hochst.; *C. elata*, Welw., appears to me to be hardly specifically distinct from *C. lachnocarpa*, Hochst.; and *C. ramosissima*, Baker, must become *C. huillensis*, Taubert, as there is an earlier *C. ramosissima*, Roxb.

Shortly after the publication of the 'Flora of Tropical Africa,' Franchet described the plants collected in Somaliland by M. Revoil, among them many Crotalarias. Unfortunately he called one of his species *C. argyræa*, a name previously used by Welwitsch for a different plant. He also published *C. dumosa*, which is synonymous with *C. Jamesii*, Oliver; and *C. petiolaris*, an ally of *C. laburnifolia*, Linn., of which a southern variety occurs in the Transvaal.

In 1878 and 1879 Vatke published the plants collected by Hildebrandt in the 'Œsterreiche Botanische Zeitung,' enumerating 24 species, 4 being novelties; and in 1892 Drs. Engler and Taubert described the Crotalarias in the 'Hochgebirgs Flora des Tropischen Afrika,' but one of the species described by Taubert, *C. kilimandscharica*, is synonymous with the earlier *C. natalitia*, Meissner. In 1894, in Engler's 'Ueber die Gliederung der

Vegetation von Usambara und den angrenzenden Gebiete,' there are 13 species mentioned as occurring in that region, amongst them the very fine *C. grandibracteata*, Taubert, an ally of *C. laburnifolia*, Linn., but easily distinguished by the large bracts. Also noted as occurring there are *C. Hildebrandtii*, Vatke, *C. polychotoma*, Taubert, and *C. Holstii*, Taubert but, as already stated, *C. Hildebrandtii*, Vatke, is *C. axillaris*, Dryander, and I think it is hardly advisable to separate *C. polychotoma*, Taubert, from *C. microcarpa*, Hochst., or *C. Holstii*, Taubert, from *C. Thomsoni*, Oliver.

In 1895, Dr. Taubert in Engler's 'Pflanzenwelt Ost-Afrikas,' Theil C, pp. 204–207, gives a useful list of the members of this genus occurring on the eastern side of the Continent. There are 56 species mentioned, of which 15 are novelties. These latter include *C. imperialis*, Taubert, and *C. megistantha*, Taubert, allies of *C. agatiflora*, Schweinfurth, this series having the largest flowers among the African species, with very longly stipitate pods. Dr. Taubert uses the Groups adopted in the 'Flora of Tropical Africa.'

In 1896, Part I. of Hiern's Catalogue of African Plants, collected by Welwitsch, appeared, in which the notes made by this excellent collector on his very fine Angolan collections are published. Also in the year 1896 Dr. Schweinfurth published in the Bull. Herb. Boissier, Appendix, vol. ii., the determinations of the Leguminosæ collected by him in Arabia and Eritrea. In the same year Dr. Taubert, in Engl. Jahrb. xxiii., described some new species. He there states that he considers *C. florida*, Welw., and *C. globifera*, E. Meyer, as synonymous, but I have compared types of both these plants and they appear quite distinct, both in inflorescence and character of pod.

Dr. Schinz, in 1900, in 'Die Pflanzenwelt Deutsch Süd-West Africas' (Mém. de L'herb. Boiss. no. 1), gives a valuable enumeration of the plants of German South-West Africa, describing several novelties, but I hardly think it desirable to retain *C. apiculata*, Schinz, as specifically distinct from *C. platysepala*, Harvey, whilst *C. Pechueliana*, Schinz, is synonymous with *C. argyræa*, Welw. *non* Franchet, and the affinity of *C. Belckii*, Schinz, is rather with *C. podocarpa*, DC., than with *C. natalitia*, Meissner.

In 1903 (in Bull. Herb. Boiss.) Dr. Schinz published 5 species from German South-West Africa. These were re-published in 1907 (Vierteljahr. Nat. Ges. Zürich) with certain additions.

In 1908, in the Ann. del R. Inst. Bot. Roma, Dr. Pirotta published the 'Flora della Colonia Eritrea,' the Leguminosæ being by Dr. Chiovenda. It is interesting to find *C. Deflersii*, Schweinf., here recorded for Eritrea, but I am doubtful about the plant recorded as *C. cylindrica*, A. Rich. This species is the same as *C. tigrensis*, Baker, but is not *C. carinata*, Steudel *apud* Schimper, no. 772, which is referred to it by Dr. Chiovenda.

In 1909 Th. and Hélène Durand, in 'Sylloge Floræ Congolanæ,'

enumerated the 34 species then known from that region, many of them described by Dr. De Wildeman in the 'Annales' of the Congo Museum; but the number of species now known is somewhat larger, thanks principally to the labours of T. Kässner, M. Bequaert, and the Rev. F. Rogers.

The plant enumerated in the 'Sylloge' as *C. spartea*, R. Br., is *C. glauca*, Willd., but by a curious coincidence the true *C. spartea* has recently been collected in the Congo Region; *C. lanceolata*, E. Meyer, is in part *C. intermedia*, Kotschy; *C. Descampsii*, Micheli, is a very close ally of *C. nyikensis*, Baker, and *C. dubia*, De Wild., appears hardly to be specifically distinct from *C. prolongata*, Baker.

There are, in addition to the above, a number of other descriptions of plants of this genus, principally by Kotschy, Dr. Schweinfurth, Dr. Taubert, Dr. Harms, and my father, to which I have referred in the body of the paper.

External Morphology and Classification.

The Genus *Crotalaria* belongs to the Tribe Genisteæ of the Papilionaceæ. The flowers are zygomorphic and of the ordinary Papilionaceous type, the posterior petal being the Standard or Vexillum, the lateral petals the Wings or Alæ, and the two anterior being connate to form the Keel or Carina.

There is considerable diversity of *habit* within the limits of the genus. Some species, such as *C. Kässneri*, Bak. fil., and *C. parvula*, Welw., are dwarf, erect, or suberect annuals; some, like *C. Baumii*, Harms, are prostrate annuals; some, like *C. psammophila*, Harms, are annuals about 1 metre high. Numerous species are suffruticose. *C. dumosa*, Franchet, is a little shrub. Many of the species are tall shrubs such as *C. agatiflora*, Schweinf., *C. imperialis*, Taubert, and *C. Engleri*, Harms, reaching 3–4 metres high or more. Some of the African species are spinescent.

The *stipules* are organs of great importance for taxonomic purposes. In some species they are very small or completely obsolete, *e. g.*, in *C. striata*, DC., in others they are always setaceous; sometimes they are lanceolate, while in some species they are foliaceous and may be either sessile or petiolulate; sometimes they are semilunate, as for instance in *C. verrucosa*, Linn.

The *leaves* are either simple or trifoliolate, or rarely 3–4-foliolate, or 5-foliolate as in *C. cleomifolia*, Welw. and *C. Burkeana*, Benth.; but I have not retained the Group Multifoliolatæ, since in *C. cleomifolia* for instance the leaves are also sometimes trifoliolate, and *C. Burkeana*, Benth., is so clearly an ally of the 3-foliolate *C. polysperma*, Kotschy, it seems advisable that in the sequence these species should closely approximate to one another.

In the *calyx* the lobes are generally free and either equal in length to, or longer than, the calyx-tube; they are generally either lanceolate, or triangular, or ovate. In *C. platysepala*, Harvey, they are broad and suddenly

apiculate. In *C. agatiflora*, Schweinf., and its allies the four upper lobes are connate in two pairs. Sometimes the calyx is more or less bilabiate, as in Sect. Chrysocalycinæ. *C. Seemeniana*, Harms, has curious broad upper lobes. In *C. platycalyx*, Steud., the upper lobes are foliaceous. The *petals* vary much in size, and, the carina especially, much in shape. In *C. minutissima*, Bak. fil., and *C. bongensis*, Bak. fil., the flowers are 3·5–5 mm. long, while in *C. agatiflora*, Schweinf., and its allies the flowers are 35–55 mm. long. A point of considerable interest is that the same type of flower is associated with the same type of pod; thus the type of flower of *C. agatiflora* with large flowers, with obliquely rostrate carina considerably longer than the alæ, is always associated with a very longly stipitate pod, while in *C. lachnocarpa*, Hochst., with which I have associated *C. elata*, Welw., we have quite a different type of flower; the carina is dorsally rounded, the rostrum much shorter, and flowers of this type are associated with sessile or subsessile, oblong or oblong-cylindrical pods, densely clothed with a thick tomentum. Then we have the type of flower of *C. polysperma*, Kotschy, with a long calyx with conspicuous bracteoles at the base, the teeth being much longer than the tube, the corolla about equalling the calyx; this type of flower is always associated with a very hairy, or pilose, egg-shaped pod. A very common type of flower in this genus is one in which the petals are distinctly longer than the calyx, the conspicuous feature being that the carina is bent dorsally at an angle approaching a right angle, the rostrum is long and straight, the pod is sessile or shortly stipitate, and if the flower be small it is generally globose or subglobose, if larger the pod is generally egg-shaped. Again we have the type of flower found in *C. glauca*, Willd., where the petals are distinctly longer than the calyx, the carina is dorsally rounded, the standard is recurved; this type of flower is associated with a linear-oblong stipitate pod. In *C. farcta*, R. Br., the corolla is yellow, longer than the calyx, the carina dorsally rounded, the pods in this species and its allies are slightly curved, and the seeds inside are embedded in silky hairs or wool. In the group characterised by the type of flower found in *C. intermedia*, Kotschy, and its allies the pods are cylindrical or oblong-cylindrical.

The *bracts and bracteoles* are usually small, and the bracteoles are either situated on the calyx or on the pedicel. In *C. polysperma*, Kotschy, and its allies the bracteoles are conspicuous. In *C. platycalyx*, Steudel, there are two large ovate bracteoles below the calyx. Rarely, as in *C. grandibracteata*, Taubert, the bracts are large. In the Sect. Chrysocalycinæ the bracteoles are narrow and conspicuous.

The flowers are generally arranged in lateral or terminal racemes which are either dense or lax, sometimes short, sometimes long. In some species the flowers are in densely flowered capitula; more rarely the flowers are solitary or geminate at the end of a long peduncle. It does not seem advisable to retain the Sect. Oliganthæ, as the exact limits are most difficult to define

and in some species the flowers are sometimes in racemes, sometimes solitary. Rarely the racemes are subumbellate. Occasionally the inflorescence, as in *C. polyantha*, Taubert, is paniculate.

The *pods* vary from being one-seeded, globose, and sessile, to many-seeded, oblong, or oviform, or cylindrical, and are either sessile or stipitate. They are invariably turgid, and it does not seem advisable to place in this genus any plant which has not a distinctly inflated pod. This rule has not been adhered to invariably. The pods are either glabrous, or pubescent, or tomentose, or pilose. In Sect. Farctæ they are filled with wool or silky hairs.

The *seed* in this genus is also of considerable importance for taxonomic purposes. The seeds of a certain number of species have recently been carefully investigated by Dr. Louis Capitaine *. They are generally oval or ear-shaped, the campylotropy of the ovules being here very accentuated. Dr. Capitaine divides the seeds he investigated into two series:—A. Seeds in which the radicular prominence is more or less circinate, or having the form of an overhanging boss or projection. B. Seeds in which the radicular prominence is feeble. In series A come *C. retusa*, Linn., *C. striata*, DC., *C. laburnifolia*, Linn., *C. incana*, Linn. In series B, *C. verrucosa*, Linn., etc.

The earliest attempt to classify this large genus was by Linnæus in 1753 (Sp. Pl. ed. I. p. 714); he subdivided it into A. *Foliis simplicibus* and B. *Foliis compositis*, divisions which have been adopted by nearly all subsequent authors. De Candolle in 1825 (Prod. vol. ii.) follows Linnæus with further subdivisions; but Endlicher ('Genera' in 1836–40) relied entirely upon the character and shape of the pods for his sections, and as pods are not always present, I have not thought it advisable to rely entirely on characters drawn from the fruit. A most important contribution towards the classification of the genus appeared in 1834, in Wight and Arnott's 'Prodromus,' the main divisions being founded on the leaves, but there are twelve subdivisions founded on characters drawn from the habit, the character of the stipules, pod, etc. Another most important paper, as already stated, was published by Bentham in Hooker's 'London Journal of Botany' in 1843, in which the author, following on the lines of Wight and Arnott, relied mainly on foliage and habit to characterise his groups. Harvey, in the 'Flora Capensis' (in 1861–62), adopted three groups:—(1) Simplicifoliæ, (2) Oliganthæ, (3) Racemosæ; but while these groups are fairly satisfactory when dealing only with the South African species, they do not seem applicable when dealing with all the African species, as we have plants such as *C. lukwangulensis*, Harms, and *C. ukingensis*, Harms, which sometimes have solitary flowers and sometimes have flowers in racemes, and thus the same plant would have to be both in Oliganthæ and Racemosæ. My father,

* 'Les graines de Légumineuses,' p. 28, etc.

in the 'Flora of Tropical Africa,' has seven groups:—(1) Simplicifoliæ, (2) Sphærocarpæ, (3) Oliganthæ, (4) Chrysocalycinæ, (5) Oocarpæ, (6) Cylindrocarpæ, (7) Multifoliolatæ.

I have adopted Simplicifoliæ and Sphærocarpæ exactly as defined in this Flora, the first being plants with entirely simple leaves, the second being plants with trifoliolate leaves or rarely trifoliolate and simple leaves, with globose or subglobose pods, and always small or rather small flowers. The Oliganthæ for reasons just stated I do not adopt as a section, but as a subsection. The Sect. Chrysocalycinæ I have adopted as used by Bentham. It was founded on the genus *Chrysocalyx*, Guill. & Perr., and as a very anomalous species I include *C. nigricans*, Baker, with broad and not, as usual, narrow bracteoles. The exact limits of the Oocarpæ I find too difficult to define, but I have resuscitated Bentham's Group Farctæ for plants in which the seeds are embedded in wool in the pods, and I use the Sect. Spinosæ for *C. spinosa*, Hochst., and its allies, while in Eucrotalaria I have placed nonspinose plants with 3–5-foliolate leaves, with oblong, oviform, or cylindrical pods in which the seeds are not embedded in wool.

On the Delimitation of the Genus *Crotalaria*.

Perhaps the four most important points for distinguishing the plants of this genus are:—(*a*) The generally free calycine lobes, (*b*) the rostrate carina, (*c*) the monadelphous stamens, and (*d*) the inflated pod; any departure from this structure is a factor which tends to disturb homogeneity. Besides these points there is the character of the inflorescence which, however, is subject to considerable variation.

A certain number of plants which have been described as Crotalarias do not conform to all the above requirements, and it is a matter in which there might be considerable difference of opinion as to which should be retained and which should be excluded.

Beginning with the calyx, we have a series containing *C. agatiflora*, Schweinf., *C. Erlangeri*, Harms, *C. imperialis*, Taubert, *C. Dawei*, Bak. fil., etc., in which the four upper lobes of the calyx are connate in two pairs. I think there is no doubt that these plants must be included, as the pods of those species as far as they are known are inflated and stipitate. These species are in fact allied to *C. laburnifolia*, Linn., but the carina is of rather a different shape and the flowers are larger. Then occasionally we have plants in which the carina is blunt and not sharply rostrate—for example, *C. purpurea*, Vent. This is a curious species with purplish flowers, but I have followed Harvey, though with some hesitation, in including this plant.

In my opinion a distinctly inflated pod is an essential character, and as the pod of *C. leptocarpa*, Balf. fil. (Botany of Socotra, t. 14 A), is not at all

inflated or tumid, and the valves are quite thin and membranous, I would exclude this species.

Another doubtful plant is the species originally described as *Crotalaria lenticula* by E. Meyer. This is an interesting little plant, with solitary flowers opposite the leaves, and a distinctly rostrate carina ; the four upper lobes of the calyx are not connate in two pairs, and the lowest lobe is distinctly narrower than the rest. When describing this species E. Meyer added the following note :—" Legumen magis compressum quam ullius alius Crotalariæ mihi notæ sed carina angulo fere recto longe rostrata una cum staminibus monadelphis aut Crotalariis inserere aut peculiare genus condere cogunt." Bentham, however, transferred it to the genus *Lotononis* presumably on account of the somewhat compressed pods, and I have followed him in considering it a species of this genus, but it certainly has affinity with *C. sparsiflora*, E. Mey., which I am retaining in *Crotalaria*. The exact limits between *Crotalaria* and *Lotononis* are difficult to define. They may, perhaps, be best summarised as follows :—

Crotalaria.	*Lotononis.*
Calyx-lobes free or sometimes subbilabiate, the upper lip bifid, the lower trifid, rarely four upper lobes connate in two pairs.	Calyx subunequally 5-fid, the lowest lobe narrower than the rest, the four upper lobes approaching in pairs, rarely quite separate.
Carina rostrate, very rarely obtuse.	Carina obtuse or acute.
Inflorescence various.	Inflorescence various, racemose, umbellate, capitate, or with solitary flowers.
Pod turgid, of various shapes.	Pod oblong or linear, more or less compressed.

Besides *Lotononis lenticula*, Benth. (*Crotalaria lenticula*, E. Mey.), the following plants have a rostrate carina, but the pod of those in which the fruit is known is not as inflated as is usual in *Crotalaria*, or the inflorescence is not satisfactory for this genus. I have therefore decided not to include the following :—*Lotononis perplexa*, Eckl. & Zeyh. (*Crotalaria perplexa*, E. Mey.), *Lotononis micrantha*, Bentham (*Crotalaria micrantha*, E. Mey.), *Lotononis acutiflora*, Benth. (*Crotalaria quinata*, E. Mey.), *Lotononis namaquensis*, Bolus, *Lotononis arenicola*, Schlechter.

Material.

The work on this paper has principally been done at the National Herbarium at South Kensington, with which I am officially connected; but I have paid frequent visits to the Kew Herbarium, and I have to thank Sir David Prain, F.R.S., and Dr. Stapf, F.R.S., for permission to work there. Thanks to the courtesy of the Trustees of the British Museum, I had the opportunity of working at the Herbaria at Berlin, Brussels, and Paris,

and I have to thank the Directors of those establishments, and also Dr. Urban and Dr. Harms, for their kindness and courtesy, and especially to thank Dr. Schinz for the kind loan of his unrivalled collections from German South-West Africa. When at Berlin I also had the opportunity of consulting Dr. Schweinfurth's very fine collections from Bongoland and Niamniamland; and at Paris, thanks to the courtesy of Dr. Lecomte, I have been enabled to study the types of Lamarck's Herbarium.

I have also to thank my friends Mr. Spencer Moore, Mr. N. E. Brown, and Mr. T. A. Sprague for kind help, and I am indebted to Miss R. M. Cardew for the drawings.

Summary of Results.

In this paper I have given short descriptions of the 309 species known to me as occurring in Africa. Of these, 40 belong to the Sect. Simplicifoliæ, 66 to the Sphærocarpæ, 7 to the Chrysocalycinæ, 4 to the Spinosæ, 5 to the Faretæ, 25 to Eucrotalaria subsect. Grandifloræ, 62 to subsect. Mediocrifloræ, 49 to subsect. Parvifloræ, 33 to subsect. Oliganthæ, 18 to subsect. Stipulosæ.

The genus extends from Egypt and the Sudan and the Sahara in the north, to Cape Colony in the south. The species occurring in Egypt are *C. ægyptiaca*, Benth., and *C. thebaica*, DC., two shrubby plants belonging to the Simplicifoliæ, with a subephedroid habit, not allied to any other African species except *C. arenaria*, Benth.

C. Saharæ, Cosson, from the Sahara, is also a species without any distinct alliance to any other African member of the genus.

There are 76 novelties described, but some of these are species which I found at Berlin, with MS. names by Dr. Taubert or Dr. Harms. Of these novelties, 9 belong to the Sect. Simplicifoliæ, 21 to the Sphærocarpæ, 1 to the Spinosæ, 45 to Eucrotalaria.

Properties of the Genus.

Several species of this genus have a most injurious effect on stock. This has been discussed by Mr. J. Burtt Davy * in his paper "Notes on *Crotalaria Burkeana* and other Leguminosæ causing Disease in Stock," and in a paper "Eine neue, für das Vieh gefährliche *Crotalaria*-Art aus Deutsch Ost-Africa (*C. Zimmermannii*), von E. G. Baker, mit einem Zusatz über giftige Crotalarien Ost-Africas, von Dr. Harms" †. The interesting point to notice is that the species possessing injurious properties are all nearly allied to one another. The species are *C. Zimmermannii*, Bak. fil., *C. polysperma*, Kotschy, *C. Burkeana*, Benth., and perhaps *C. Quartiniana*, A. Rich.

* South African Journ. of Science, viii. (April 1901) p. 269.

† Notizblatt Königl. Bot.-Garten, Band vi. (1913) No. 53, pp. 66-69.

DEFINITION OF THE GENUS.

CROTALARIA,

Dill. ex Linn. Gen. Pl. ed. I. (1737) p. 218, pro parte; Linn. Sp. Plantarum, ed. I. (1753) p. 714, pro maxima parte; Endlicher, Genera, No. 6472, pro parte (1836–40); Benth. & Hook. fil., Genera Plantarum, i. p. 479; Taubert in Engler & Prantl, Pflanzenfamilien, iii. 3. p. 226 (1871); Dalla Torre & Harms, Genera Siphonogamarum, No. 3669.

Clavulium, Desv. in Ann. Sc. Nat., sér. 1, ix. (1826) 407.
Chrysocalyx, Guill. et Perrottet, Fl. Seneg. Tent. 157, t. 43 (1832).
Maria-Antonia, Parlatore, *Maria-Antonia*, nov. gen. Legum. (1844), cum icon.
Phyllocalyx, Hochst. ex A. Rich. Fl. Abyss. i. 160, t. 34 (1847).

Calycis tubus sæpissime oblique campanulatus; lobi liberi, subæquales, lanceolati vel deltoidei, tubo sæpius longiores interdum breviores vel rarius 2 superiores et 3 inferiores plus minus connati, vel 4 superiores per paria subcohærentes et lobus inferior quam alii angustior, rarissime calycis lobi superiores majores et foliacei. *Corolla* calyce sæpius longior, rarissime brevior. *Vexillum* orbiculatum vel ovatum, dorso glabrum vel pubescens vel hirsutum, basi sæpissime unguiculatum, et supra unguem sæpe bicallosum. *Alæ* carina sæpius breviores. *Carina* ambitu et longitudine maxime variabilis, dorso sæpe angulo fere recto curvata, vel rotundata, quum dorso angulo recto curvata tum hinc in rostrum longum et rectum sæpius attenuata, interdum apicem versus subito in rostrum contracta, rarius rostro fere nullo, apice sæpe incurva. *Stamina* omnia in vaginam supra fissam connata; antheræ alternatim parvæ et longæ, basifixæ. *Ovarium* sessile vel stipitatum, 2–∞-ovulatum; stylus supra ovarium valde incurvus, vel sæpius abrupte inflexus, superne intus plus minus longitudinaliter barbatus. *Legumen* sessile vel stipitatum, globosum, oblongum, oviforme vel cylindricum, turgidum vel inflatum, rarissime lateraliter subcompressum, 2-valve, rarissime intus lana repletum, intus continuum. *Semina* estrophiolata, funiculis filiformibus.

Herbæ, vel *suffrutices*, vel *frutices*, inermes, vel rarius spinescentes. *Folia* simplicia, vel trifoliolata, vel quinquefoliolata, vel simplicia et trifoliolata intermixta. *Stipulæ* maxime variabiles, a petiolo liberæ, sæpissime parvæ, vel lanceolatæ, interdum foliaceæ, semilunatæ, vel obovatæ, vel falcatæ; in speciebus paucis omnino deesse videntur. *Flores* maximi, mediocres, vel parvi, flavi, cærulei vel purpurascentes interdum lineis notati, racemosi, vel rarius solitarii, racemis terminalibus vel oppositiifoliis, interdum in capitula ad apices ramorum dispositi. *Bracteæ* parvæ, vel rarius foliaceæ. *Bracteolæ* sæpissime parvæ, in pedicello vel in calyce ipso sitæ, rarissime magnæ, vel rarius 0.

Species Africæ borealis et tropicæ et australis ad 309 in sectiones sequentes distribuuntur.

Conspectus Sectionum.

A. Folia simplicia : Sect. I. Simplicifoliæ, Benth. (pp. 252–273).

B. Folia sæpissime trifoliolata, rarius simplicia et trifoliolata, et rarius 4–5-foliolata.

(*a*) Legumina intus lana repleta : Sect. IV. Farctæ, Benth. (pp. 308–310).

(*b*) Legumina intus glabra.

† Herbæ vel suffrutices spinescentes : Sect. V. Spinosæ, Bak. fil. (pp. 310–313).

†† Herbæ vel suffrutices vel frutices inermes.

* Flores parvi. Corolla calyce sæpius longior. Legumen globosum vel oblongo-globosum, oligospermum :
Sect. II. Sphærocarpæ, Benth. (pp. 273–304).

** Flores mediocres. Corolla calyce brevior vel vix longior. Flores spicati, vel glomerati. Legumen globosum, vel oblongo-globosum, plurispermum : Sect. III. Chrysocalycinæ, Benth. (pp. 305–308).
(*Chrysocalyx*, Guill. & Perrottet.)

*** Flores maximi, vel mediocres, vel parvi. Corolla calyce sæpius longior. Legumen cylindricum, oblongum, oviforme, stipitatum vel sessile, nunquam globosum, plurispermum vel multispermum :
Sect. VI. Eucrotalaria, Bak. fil. (pp. 313–414).

Sect. I. SIMPLICIFOLIÆ, Benth. in Hooker's Lond. Journ. Bot. ii. (1843) 473.

Folia simplicia.

Clavis specierum.

1.	Stipulæ foliaceæ	*verrucosa.*
	Stipulæ parvæ vel angustæ vel obsoletæ	2
2.	Flores in racemos vel in capitula dispositi..........	3
	Flores solitarii, longe pedicellati	33
3.	Flores parvi vel parviusculi. Carina 3–10 mm. longa	4
	Flores majusculi. Carina 11–20 mm. longa	23
4.	Racemi vel capitula densi	5
	Racemi laxi vel laxiusculi	7
5.	Folia anguste linearia	*passerinoides.*
	Folia latiora	6
6 (*a*)	Folia ovata vel elliptica. Legumina subglobosa, pilis dense vestita. Flores in racemos dispositi	*cylindrostachys.*
(*b*)	Folia ovata, rotundata vel oblonga. Legumina oblonga, dense sericea. Flores in capitula dispositi	*anthyllopsis.*
(*c*)	Folia oblonga vel lanceolato-oblonga. Legumina subglobosa vel oblongo-globosa, villosa	*kipandensis.*

7.	Herbæ annuæ, vel perennes, haud armatæ	8
	Suffrutices vel frutices, rigidi, subspinescentes	21
8 (*a*)	Carina dorso genuflexa, circ. 4 mm. longa. Herba cinereo-viridis. Legumina oblonga, 6–9-sperma	*polygaloides.*
(*b*)	Carina naviculariformis, 4–5 mm. longa. Herbacea, foliis hirsutis canescentibus. Legumina circ. 26-sperma, subcylindrica, ex descriptione	*Leprieurii.*
(*c*)	Carina dorso genuflexa, 5–6 mm. longa. Folia pubescentia vel hirsuta. Legumina circ. 8–12-sperma	*bongensis.*
(*d*)	Carina dorso semiorbicularis, 5–10 mm. longa. Folia glabra, puberula vel pubescentia. Inflorescentia pauciflora (sæpius 1–5).	9
(*e*)	Carina naviculariformis, 7–9 mm. longa. Folia pubescentia vel superne glabra. Inflorescentia sæpius 5–12-flora	14
(*f*)	Carina dorso angulo fere recto curvata, inde in rostrum longum vel longiusculum attenuata, in toto 6–10 mm. longa. Folia pubescentia vel pilis patentibus obtecta. Inflorescentia 8–30-flora	15
9 (*a*)	Glabra, glauca. Folia apice acuta, rarius obtusa	*glauca.*
(*b*)	Glabra folia apice obtusa, mucronata	*amadiensis.*
(*c*)	Puberulæ, pubescentes, vel adpresse pilosæ	10
10.	Petioli 7–12 mm. longi	*incompta.*
	Petioli breviores	11
11.	Petioli 3–6 mm. longi	12
	Petioli brevissimi usque ad 1 mm. longi	13
12.	Carina circ. 6 mm. longa	*Stuhlmannii.*
	Carina 7–8 mm. longa	*anisophylla.*
13.	Folia 7–10 mm. lata	*Adamsonii.*
14.	Legumina stipitata	*psammophila.*
	Legumina sessilia	*spartea.*
15.	Folia filiformia, solum circ. 1 mm. lata	*filifolia.*
	Folia 2–15 mm. lata	16
16.	Carina sæpius 6–7 mm. longa	*karagwensis.*
	Carina 8–10 mm. longa	17
17.	Petioli 2–4 mm. longi	18
	Petioli circ. 5 mm. longi	*linearifolia.*
18.	Folia lanceolata vel lineari-lanceolata	19
	Folia oblonga vel elliptica, suprema linearia	20
19.	Vexillum lineis purpureis notatum	*Vogelii.*
	Vexillum lineis brunneis notatum	*Parsonsii.*
20.	Folia inferiora 3–4 mm. lata. Calyx circ. 3 mm. longus	*tenuipedicellata.*
	Folia inferiora 10–13 mm. lata. Calyx 4–5 mm. longus	*morumbensis.*
21.	Ovarium 2–5-ovulatum	22
	Ovarium 8–10-ovulatum	*arenaria.*
22.	Legumina pubescentia	*thebaica.*
	Legumina adulta glabra	*ægyptiaca.*
23.	Calyx longissimus, corollam obtegens	*calycina.*
	Calyx corollam non obtegens	24
24.	Caules alati vel insigniter angulati	25
	Caules non alati	26
25 (*a*)	Caules bialati	*holoptera.*
(*b*)	Caules 4-alati	*stenoptera.*
(*c*)	Caulis insigniter angulati	*angulicaulis.*

26.	Petioli 10–22 mm. longi	*Welwitschii.*
	Petioli breviores	27
27.	Inflorescentia pauciflora	28
	Inflorescentia pluri- vel multiflora	29
28.	Carina sæpius 12–14 mm. longa	30
	Carina sæpius 15–18 mm. longa	*Boehmii.*
29.	Carina dorso angulo recto curvata, inde in rostrum attenuata ..	32
	Carina dorso rotundata	*retusa.*
30.	Carina dorso angulo recto curvata, inde in rostrum longum attenuata	31
	Carina dorso rotundata	*Cornetii.*
31.	Calyx ±7 mm. longus	*sengensis.*
	Calyx 9–10 mm. longus	*rupicola.*
32.	Folia anguste oblonga vel lanceolato-linearia	*virgultalis.*
	Folia linearia vel setacea	*spartioides.*
33.	Flores minutissimi. Carina 3·5–4 mm. longa	*minutissima.*
	Flores majores	34
34.	Erecta, foliis oblongis	*amadiensis.*
	Procumbens, foliis oblanceolatis	*uniflora.*

Series 1. Flores amœne violaceo-rosei, in racemos 6–20-floros dispositi, rarius albi. Stipulæ foliaceæ, transverse recurvatæ.

1. C. VERRUCOSA, *Linn. Sp. Pl.* 715 (1753); *DC. Prod.* ii. 125; *Bot. Mag.* t. 3034; *Baker in Oliver, Fl. Trop. Afr.* ii. 14; *Hiern, Cat. Welw. Afr. Pl.* i. 196.

C. cœrulea, Jacq. Ic. Pl. Rar. t. 144 (1781–86).

C. angulosa, Lam. Dict. ii. 197 (1786).

Caulis erectus, ramosus, angulatus. *Folia* ovata, basi breviter et subito in petiolum attenuata, sæpius 35–60 mm. longa, 25–50 mm. lata, demum utrinque fere glabra, petiolo 3–5 mm. longo instructa. *Racemi* terminales et oppositifolii. *Bracteolæ* minutissimæ, circa medium pedicelli positæ. *Bracteæ* parvæ, subulateæ. *Calyx* glaber, 5-lobus. *Vexillum* viridi-album, intus cæruleo-striatum, obovatum. *Alæ* obovatæ, basi flavo-albidæ, superne cæruleæ. *Carina* dorso rotundata, apice breviter rostrata, in toto 11–13 mm. longa. *Legumen* cylindrico-oblongum, sessile, molliter pubescens, demum fere glabrum, multispermum.

SIERRA LEONE: Freetown, *Welwitsch*, No. 1940! Hb. Mus. Brit.

NIGERIA: Old Calabar, *Milne*! Hb. Mus. Brit.

FRENCH EQUATORIAL AFRICA: Banks of Gaboon, *Mann*! Hb. Kew.

ZANZIBAR: fide *Baillon*.

Var. OBTUSA, *DC. Prod.* ii. 125 (1825).

Folia apice valde obtusa.

FRENCH EQUATORIAL AFRICA: Gaboon, *Buchholz* No. 117! Hb. Berol.

This is one of the oldest and best known species of *Crotalaria*. It is figured by Hermann in his Hort. Acad. Lugduno-Batavus, p. 199 icon., and there is a specimen and drawing in the Hermann collection in the National Herbarium. It is widely spread in the Tropics and formed, together with three other Indian species, Wight and Arnott's group Verrucosæ, characterised by the softly pubescent pods, the distinctly petioled leaves, and the lunate, transverse recurved stipules.

Series 2. Flores parviusculi, luteoli, axillares. Carina circ. 4 mm. longa. Stipulæ oculo nudo vix conspicuæ. Herba cinereo-viridis.

2. C. POLYGALOIDES, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 15 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 196.

Herba habitu Polygalæ. *Folia* breviter petiolata, oblonga vel oblongo-oblanceolata, apice rotundata, basi cuneata, 2·5–3·5 mm. longa, 5–10 mm. lata. *Flores* pedunculati. *Calyx* profunde 5-fidus, lobis 2 superioribus majoribus. *Vexillum* oblongo-ovatum, breviter et late unguiculatum, basi bicallosum. *Carina* albido-lutea, apice vix rostrata, dorso genuflexa, calyce brevior. *Legumen* parvum, oblongum, 6–8 mm. longum, demum glabrum, 6–9-spermum.

SIERRA LEONE: Wallia, *Scott Elliot* No. 4280! Hb. Mus. Brit.

FRENCH EQUATORIAL AFRICA: Haut Oubangui, *Chevalier* No. 6121! Hb. Kew.

CONGO REGION: Kisantu, *Gillet*! Hb. Brux.

ANGOLA: Golungo Alto, *Welwitsch* Nos. 1922! & 1922 *b*! Hb. Mus. Brit.

Series 3. Flores minutissima, solitarii, pedicellati. Carina apice in rostrum gracilem acutum attenuata, in toto 3–4 mm. longa. Folia angusta. Annua.

3. C. MINUTISSIMA, *Bak. fil.*, sp. nov. (Pl. **9**.)

Annua, erecta, ramosa, gracilis, circ. 15 cm. alta. *Stipulæ* inconspicuæ. *Folia* angustissima, 10–25 mm. longa, pilis albidis strigoso-pubescentia. *Flores* minutissimi, inter minimos generis, solitarii, graciliter pedicellati. *Bracteolæ* parvæ, apicem versus pedicellorum positæ. *Calyx* brevis, extus strigoso-pubescens, dentibus lanceolatis, acutis, in toto circ. 2 mm. longus. *Vexillum* calyce 2–3-plo longius, apice mucronatum. *Carina* dorso genuflexa. *Legumen* oblongum, juvenile pilis obtectum, demum glabrum, calyce compluries longius, sessile, in toto 6–7 mm. longum.

Species ad *C. bongensem*, Bak. fil., accedens, a qua primo intuitu facile distinguenda, floribus minutissimis solitariis, etc.

CONGO REGION: Katanga, *S. Ringoet* No. 524! Hb. Brux. In flower March 1912.

A slender annual, with very narrow leaves, and very small, pedicellate, minute flowers. The carina is distinctly rostrate and 3–4 mm. long.

Series 4. Flores parviusculi, in racemos laxos dispositi. Carina 5–6·0 mm. longa. Annua, ramosissima, pubescens vel hirsuta.

4. C. BONGENSIS, *Bak. fil.*, sp. nov.

Annua. Rami tenues, 10–12 cm. longi. *Stipulæ* oculo nudo haud conspicuæ. *Folia* lineari-lanceolata, acuta, 3–5 cm. longa, 3–4·5 mm. lata, subtus pilis plus minusve tecta, costa subtus conspicua, petiolo 2–3 mm. longo instructa. *Racemi* axillares, in typo sæpius 1–2–3-flori. *Bracteæ* parvæ, acutæ. *Flores* parviusculi, quam ei *C. glaucæ*, Willd., minores. *Calycis* tubus campanulatus; laciniæ lanceolatæ, acutæ, tubo subæquilongæ. *Alæ* oblongæ, apice obtusæ, carina breviores. *Carina* naviculariformis, dorso rectangulari-curvata, apice in rostrum attenuata, unguiculata. *Legumen* subsessile, oblongum, turgidum, 7–8 mm. longum, 3 mm. latum, primum pubescens, demum glabrescens, stipite circ. 0·5 mm. longo instructum, circ. 8-spermum.

Species ab *C. glauca*, Willd., primo intuitu differt floribus et leguminibus minoribus, foliis plus minusve hirsutis.

BONGOLAND: Gir, *Schweinfurth* No. 2135! Hb. Kew. etc.

DJURLAND: Seriba Ghattas, *Schweinfurth* No. 2300! Hb. Kew. etc.

Var. nov. CAMERUNENSIS, *Bak. fil.*

Caulis 20–30 cm. altus, ramosissimus. *Folia* 3–8 cm. longa, 4–5·5 mm. lata. *Flores* in racemos 3–15-floros dispositi. *Calyx* 3·5 mm. longus. *Vexillum* ±4 mm. longum, flavum, lineis purpureis notatum. *Carina* 5–5·5 mm. longa. *Legumen* oviforme, subsessile, circ. 7 mm. longum.

CAMEROONS: Djauro Putju, *Ledermann* No. 5376! Hb. Berol.

A plant gathered at Mashita (*Ledermann* No. 5366) is allied, but it has broader leaves.

Var. nov. SHIRENSIS, *Bak. fil.*

Annua, ramosissima. *Folia* lineari-lanceolata. *Legumen* cylindricum, 10–13 mm. longum.

NYASALAND: Shire Highlands, *Buchanan* (1891) No. 57! Hb. Kew.

The distinguishing features of this species are the copiously branched diffuse habit, the linear-lanceolate, shortly petiolate, more or less hirsute leaves, the lax racemes, and the turgid, oblong, subsessile, finely glabrescent pods which are much shorter than in *C. glauca*, Willd.

Series 5. Flores in racemum multiflorum densum dispositi. Carina ±5 mm. longa, dorso rotundata. Annua erecta, herbacea, pilis rufescentibus et patulis vestita.

5. C. CYLINDROSTACHYS, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 15 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 197.

Annua. Stipulæ subulatæ. *Folia* ovata vel elliptica, apice acuta, 3·5–5·0 cm. longa, 16–18 mm. lata, pilis ferrugineis utrinque vestita, petiolo 3–7 mm. longo prædita. *Flores* flavi, in racemum spiciformem 2–10 cm. longum dispositi. *Bracteæ* lineares, longæ. *Calyx* pilis ferrugineis vestitus, in toto 3–3·5 mm. longus; laciniæ lanceolatæ. *Vexillum* lineis purpureis notatum, carinæ subæquilongum, 5 mm. longum. *Alæ* lineis notatæ, oblongæ. *Carina* apice in rostrum non attenuata. *Legumen* subglobosum, pilis ferrugineis dense vestitum.

ANGOLA: Huilla, between Eme and Ivantala, *Welwitsch* No. 1941! Malange, *Gossweiler* No. 1351! Hb. Mus. Brit.; Huilla, *Antunes & Dekindt* No. 3167! Hb. Mus. Paris.

GERMAN EAST AFRICA: Ugogo, *Hannington*! Hb. Kew.; Uzamba, *Hannington*! Hb. Kew.; Irumba, *Stuhlmann* No. 4218! Ussihe, *Stuhlmann* No. 4211! Mlalo, *Stuhlmann* No. 205! Hb. Berol.

RHODESIA: Victoria, *C. F. Monro* No. 1045! Hb. Mus. Brit.

Series 6. Flores parvi, in racemum elongatum densum dispositi. Annua, erecta, superne ramosa, foliis anguste linearibus superne glabris subtus pubescentibus.

6. C. PASSERINOIDES, *Taubert in Engler, Pflanzenwelt Ost-Afr.* C. 204 (1895).

Caulis circ. 6 dm. altus. *Stipulæ* parvæ. *Folia* anguste linearia, apice acuta, 15–20 mm. longa, 2·5–3·0 mm. lata, superne glabra, subtus adpresse pubescentia. *Racemi* terminales, elongati, inferne foliati. *Flores* parvi, numerosi. *Calyx* totus 3 mm. longus, dentibus acutis. *Corolla* in exempl. Hb. Berol. jam delapsa, ignota. *Legumen* parvum, ellipsoideo-globosum, calycem 1·5–2-plo excedens, 3–4 mm. longum, hirtum, brevissime stipitatum, monospermum.

GERMAN EAST AFRICA: Tabora, *Stuhlmann* No. 621! Hb. Berol.

Dr. Taubert states that this recalls in habit *Passerina annua*, Wikst.

Series 7. Flores in racemos laxos dispositi. Carina 6–10 mm. longa. Suffrutices vel herbæ rigidi, subspinescentes. Folia oblonga vel ovata vel rami subaphylli.

7. C. THEBAICA, *DC. Prod.* ii. 128 (1825); *Baker in Oliver, l. c.* ii. 11; *Boiss. Fl. Or.* ii. 25; *Muschler, Fl. Egypt.* i. 472.

Spartium thebaicum, Delile, Fl. d'Égypte, 250, t. 37. fig. 1 (1812).

Ramosissima, diffusa, patentim et breviter pilosa, ramis rigidis divaricatis,

ramulis spinescentibus. *Stipulæ* nullæ. *Folia* oblonga vel ovalia, 2–5–10 mm. longa, subsessilia vel brevissime petiolata. *Flores* lutei, lineis fuscis striati, pauci, secus ramulos laxe racemosi, brevissime pedicellati. *Bracteolæ* parvæ. *Calycis lobi* lanceolati, tubo subtriplo longiores. *Vexillum* 6–7 mm. longum. *Alæ* oblongæ, 5–6 mm. longæ. *Ovarium* 2–3-ovulatum. *Legumen* sessile, subglobosum vel oblongo-globosum, calyce subduplo longius, 6–8 mm. longum, pubescens, 2–3-spermum.

MIDDLE AND UPPER EGYPT, SUDAN, many collectors.

8. C. ÆGYPTIACA, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 473 ; *Boiss. Fl. Or.* ii. 25 ; *Muschler, Fl. Egypt.* i. 472.

Radix longa. *Planta* ramosissima, rigida, habitu *Ephedræ*. *Rami* breves, sæpe fere aphylli, subspinescentes, ramulis tomento brevi canescentibus vel glabris. *Folia* rara, ovata vel oblonga, 3–9 mm. longa, undulata, tomentoso-pubescentia, petiolis brevibus. *Flores* pauci, laxe racemosi, brevissime pedicellati. *Bracteolæ* parvæ. *Calyx* tomentoso-pubescens, laciniis lanceolatis tubo 2–3-plo longioribus, in toto circ. 6–7 mm. longus. *Carina* calyce longior 7–9 mm. longa, dorso angulo fere recto curvata, apice acuta. *Ovarium* 2–3-ovulatum. *Legumen* ovoideum, calyce 2–3-plo longius, sæpe circ. 10–12 mm. longum, glabrum vel junius minute tomentellum.

EGYPT, SUDAN: Desert of Suez, *Bove* No. 184 ! Hb. Kew. ; Upper Egypt, *Parlatore* ! Hb. Kew. ; Egypt, *Ehrenberg* ! Hb. Berol. ; Waddi Hagga, *Schweinfurth* No. 14 ! Hb. Turic. ; Wadi Chaefera, *Schweinfurth* No. 15 ! Hb. Turic. ; Nubian Coast, Gabel Ferayeh, *Schweinfurth* No. 1733 ! Hb. Schweinf. ; Between Kosseir and Ras Benan, *Schweinfurth* Nos. 1731 & 1732 ! Hb. Schweinf.

A plant collected by *Hildebrandt* (No. 888 *a*) near Lasgori, Somaliland, is very closely allied.

9. C. ARENARIA, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 474 ; *Baker in Oliver, Fl. Trop. Afr.* ii. 11, non *Zoll. & Mor.*

C. thebaica, Guill. & Perr. Fl. Seneg. Tent. i. 160 (1832), *non* DC.

Prostrata, subspinescens, ramulis pilis patenter reflexis dense villosis. *Stipulæ* nullæ. *Folia* ovato-oblonga vel ovata, 5–10–15 mm. longa, undulata. *Flores* pauci, ad apicem ramorum distanter subspicati. *Calyx* villosissimus ; laciniæ lanceolatæ, tubo subtriplo longiores. *Alæ* oblongæ, 4 mm. longæ, unguiculatæ. *Carina* naviculariformis, 5 mm. longa. *Ovarium* rufo-pubescens, 8–10-ovulatum. *Legumen* oblongo-globosum vel oviforme, calyce duplo longius, 8–12 mm. longum, tomentosum vel villosum, 6–8-spermum.

SENEGAMBIA : *Leprieur & Perrottet* ! *Heudelot* ! *Roger* ! Hb. Kew. ; Dakar, *Thiebaut* No. 197 ! Hb. Mus. Paris ; Environs of Richard Tol, *Lefevre* ! Dagana Quallo, *Guillemin* ! Hb. Berol.

N. Nigeria : Katagum Distr., *Dalziel* No. 15 ! Hb. Kew.

The plant distributed as *C. arenaria*, Benth. by M. Chevalier, from Timbuctoo, No. 1264, is *Requienia obcordata*, DC.

Series 8. Flores pauci, sæpius 1–4, interdum in varietatibus *C. glaucæ* Willd. numerosiores. Carina dorso rotundata, 5–9 mm. longa. Herbæ annuæ, erectæ, rarius perennes, glabræ vel pubescentes.

10. C. glauca, *Willd. Sp. Pl.* iii. 974 (1800) ; *DC. Prod.* ii. 127 ; *Schum. et Thonn. Guin. Pl.* 334 ; *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 480 ; *Baker in Oliver, Fl. Trop. Afr.* ii. 12.

C. acutifolia, Steud. in Schimp. Pl. Abyss. No. 829.

Caulis subherbaceus, 30–100 cm. altus, strictus, glaber, glaucescens. *Rami* teretes, læves, erecti. *Stipulæ* nullæ. *Folia* lineari-lanceolata vel lineari-oblonga, sæpissime 2–5 cm. longa, 2–10 mm. lata, glaberrima, glauca, petiolo ad 1 mm. longo prædita. *Racemi* axillares, in forma typica laxe 1–4-flori. *Calycis laciniæ* tubo longiores. *Bracteolæ* ad basin calycis geminæ, setaceæ. *Corolla* lutea. *Vexillum* subrotundum, emarginatum. *Carina* dorso semiorbicularis, 5–8 mm. longa. *Legumen* oblongum, 18–25 mm. longum, glaberrimum, stipite calycem subæquante, polyspermum.

Widely distributed in Tropical Africa from Abyssinia to Rhodesia, and collected by *Schlechter* on the south-east coast at Lion's Creek (No. 12217, Hb. Kew.).

The type was collected in Guinea by *Thonning.*

Var. genistifolia, *Bak. fil.*—C. genistifolia, *Schum. et Thonn. Pl. Guin.* 335.

Caules erecti, glabri. *Folia* lineari-lanceolata. *Racemi* laterales, 6–8-flori. *Flores* remoti.

Cameroons : *Ledermann* No. 5317 ! Hb. Berol.

Guinea : *Thonning.*

Congo Region : Kitobola, *A. Flamigni* No. 248 ! Hb. Brux.

Var. nov. humilis, *Bak. fil.*

Humilis, usque ad 15 cm. altus attingens, ramosus, fere glaber. *Folia* anguste oblonga, 10–20 mm. longa, 3–7 mm. lata, petiolo vix 1 mm. longo prædita. *Calyx* circ. 6 mm. longus. *Vexillum* suborbiculari-obovatum, 9–10 mm. longum. *Carina* 8–9 mm. longa. *Legumen* oblongum, stipitatum, cum stipite 16–18 mm. longum, glabrum.

Cameroons : Jukuria, *Ledermann* No. 2158 ! Hb. Berol. In flower 5 Jan. 1909.

A dwarf, copiously branching, nearly glabrous plant. Flowers of medium size, solitary, or subsolitary, long-pedicelled.

Var. nov. MILDBRAEDII, *Bak. fil.*

Folia inferiora quam ea typi latiora, 50–60 mm. longa, 15–18 mm. lata. *Racemi* 5–15-flori. *Bracteæ* sub pedicello angustæ, 6–10 mm. longæ.

MPORORO: Rutschuru, grass steppe, alt. 1200–1300 met., *Mildbraed* ! Hb. Berol.

Flowers of a golden colour washed with violet.

Var. nov. WELWITSCHII, *Bak. fil.*

Herba metralis vel paullo ultra, erecta. *Folia* quam ea typi latiora, interdum elliptica, in sicco nigrescentia. *Vexillum* flavum, striis aurantiacis pictum. *Alæ* luteæ. *Carina* e viridi flavescens. *Legumen* cum stipite ±20 mm. longum.

ANGOLA: Golungo Alto, *Welwitsch* Nos. 1849 ! 1949 ! Pungo Andongo, *Welwitsch* No. 4153 ! Hb. Mus. Brit.

N. RHODESIA: Mumbwa, *Mrs. Macaulay* No. 705 ! Hb. Kew.

Var. nov. ELLIOTII, *Bak. fil.*

Suffrutex. *Folia* angustissima, linearia vel lineari-lanceolata, sæpissime 4–6 cm. longa. *Racemi* laterales, laxissime 2–4-flori. *Vexillum* orbiculari-obovatum, ±6 mm. longum. *Legumen* glabrum, subcylindricum, modice stipitatum, quam ea typi angustius, ±2 cm. longum, multispermum.

BRITISH EAST AFRICA: Elmenteita, alt. 2000 metr., *G. F. Scott Elliot* No. 6734 ! Hb. Mus. Brit.

Noticeable on account of the very narrow leaves, the very lax 2–4-flowered, lateral racemes, and the stipitate, glabrous, cylindrical pod, narrower than in the type.

11. C. STUHLMANNII, *Taubert in Engler, Pflanzenwelt Ost-Afr.* C. 204 (1895).

Erecta, a basi ramosissima. *Rami* virgati, teretes. *Stipulæ* parvæ, setaceæ. *Folia* linearia vel lineari-oblonga, 3–4 cm. longa, circ. 6 mm. lata, supra glabra, subtus parce adpresse pilosa. *Petioli* 3–4 mm. longi. *Racemi* longe pedunculati, laxe pauciflori. *Bracteæ* minutæ, setaceæ. *Calyx* pedicellum æquans vel eo brevior. *Vexillum* calycem 2-plo superans, suborbiculatum. *Carina* dorso rotundata, valde curvata, ±6 mm. longum. *Ovarium* stipitatum. *Legumen* deest.

GERMAN EAST AFRICA: Uera, *Stuhlmann* No. 4188 ! Hb. Berol.

12. C. ANISOPHYLLA, *Welw. MS. in Herb. Mus. Brit.*

C. glauca, Willd., var. *anisophylla*, Welw. ex Hiern, Cat. Welw. Afr Pl. i. 195 (1896).

Annua erecta, gracilis, 25–30 cm. alta. *Stipulæ* parvæ, lineares. *Folia* inferiora oblonga vel lanceolata, superiora elongato-linearia, longe acuminata, 20–75 mm. longa, 7–12 mm. lata, subtus strigoso-pubescentia, petiolo 3–6 mm.

longo suffulta. *Pedunculi* erecti, 1–3-flori. *Bracteæ* ad basin pedicelli lineares, 1–3 mm. longæ. *Pedicelli* 3–5 mm. longi. *Calycis tubus* breviter campanulatus, dentibus lanceolatis. *Vexillum* violaceum; carina alæque luteæ. *Alæ* obovato-spathulatæ. *Carina* arcuata, dorso rotundata, unguiculata, in toto 7–8 mm. longa. *Legumen* oblongum, ±25 mm. longum et 10 mm. latum, polyspermum, stipite 5–6 mm. longo suffultum.

ANGOLA: Huilla, Lopollo, *Welwitsch* No. 1950! Pungo Andongo, *Welwitsch* No. 1947! Hb. Mus. Brit.; Angola, *Newton*! Hb. Berol.; Huilla, *Antunes & Dekindt* No. 3170! Hb. Mus. Paris.

13. C. ADAMSONII, *Bak. fil.*, sp. nov.

Radix lignosa. *Caules* angulati, virgati, plures ex eadem radice orti, 40–50 cm. longi. *Stipulæ* lineares, 1–2 mm. longæ. *Folia* oblongo-lanceolata vel lineari-oblonga, mucronata, 5–8 cm. longa, 7–10 mm. lata, sub lente strigoso-pubescentia, petiolo circ. 1 mm. longo suffulta. *Flores* mediocres. *Inflorescentia* 1–3-flora. *Pedunculi* 6–8 cm. longi. *Bracteæ* sub pedicello angustæ, quam pedicelli multoties breviores. *Pedicelli* calyce longiores. *Calyx* 8–9 mm. longus, strigosus, dentibus lanceolatis 6 mm. longis. *Vexillum* in sicco luteum, striatum, calyce paullo longius. *Carina* dorso rotundata, uncinata, circ. 9 mm. longa. *Legumen* haud visum.

NYASALAND: Shire Highlands, Mt. Soche, alt. 1830 metr., *G. Adamson* No. 321! Hbb. Kew., Mus. Brit.

Allied to *C. glauca*, Willd., but the stems are distinctly angled, and the leaves are oblong-lanceolate and slightly pubescent. The petioles are very short.

14. C. AMADIENSIS, *De Wild. in Ann. Mus. Congo, Bot.* sér. v. iii. (1911–12) 198.

Verisimiliter herba perennis, erecta, ramosa, in typo 20–30 cm. alta, caule gracili, terete. *Stipulæ* lineares. *Folia* oblonga vel oblongo-elliptica, apice obtusa, mucronata, 12–22 mm. longa, 2·5–6 mm. lata, punctata, glabra vel glabriuscula, petiolo vix 1 mm. longo prædita. *Flores* mediocres, sæpe solitarii, graciliter pedunculati, pedunculis 10–18 mm. longis. *Bracteolæ* ad apicem pedunculorum positæ, lineares. *Calyx* glaber; tubus circ. 2 mm. longus; lobi lanceolati, acuminati, circ. 4 mm. longi. *Vexillum* obovatum, cum ungue circ. 8 mm. longum et latum. *Alæ* oblongæ, carinæ subæquilongæ. *Carina* dorso rotundata, 7–8 mm. longa, rostro brevi. *Legumen* oblongum, glabrum, stipitatum, stipite calyce breviore.

CONGO REGION: Amadi, *Seret* No. 337! Hbb. Brux., Mus. Brit.

This plant is allied to *C. uniflora*, Baker, and *C. glauca*, Willd. The distinguishing characters are:—

(*a*) The slender, terete stem (in the type specimen hardly 1 mm. in diam.).
(*b*) The oblong, or oblong-elliptical, almost glabrous, very shortly petiolate

leaves. (*c*) The calyx 6 mm. long. (*d*) The carina rounded on the back with a very short rostrum. (*e*) The oblong, glabrous, stipitate pod, the stipe being about as long as the calyx-tube.

Var. BUTAYEI, *Bak. fil. in Bull. Jard. Bot. Brux.* iv. (1914) 94.

Caulis erectus, crassior, ramosus. *Folia* ut in typo. *Racemi* sæpius distanter 2–3-flori. *Carinæ rostrum* breve.

CONGO REGION: Lemfu, *R. P. Butaye* No. 1190! Hb. Brux.; Kisantu, *Vanderyst*! Hb. Brux.

15. C. INCOMPTA, *N. E. Brown in Kew Bull.* (1909) 101.

Herba erecta, e basi ramosa, minutissime pubescens. *Rami* tenuiter angulati. *Stipulæ* parvæ. *Folia* lineari-lanceolata, acuta, 25–90 mm. longa, 3–8 mm. lata, supra glabra, inter congeneres ob longitudinem petiolorum insignis, petiolo 8–12 mm. longo prædita. *Flores* mediocres, in racemos laxe 2–4-floros dispositi. *Racemi* folio breviores. *Pedicelli* 3–5 mm. longi. *Bracteæ* angustæ, ±2 mm. longæ. *Bracteolæ* 1–2 mm. longæ. *Corolla* lutea, glabra. *Calyx* totus 5 mm. longus. *Vexillum* calyce longius. *Carina* dorso rotundata, apice acuta, 8–9 mm. longa. *Legumen* adhuc ignotum.

NGAMILAND: Botletle Valley, *Lieut. E. J. Lugard* No. 205! Hb. Kew.

Series 9. Flores parviusculi, in racemos laxos 6–12-floros dispositi. Carina naviculariformis, 7–9 mm. longa. Annuæ vel perennes, erectæ vel ramis adscendentibus, elatæ.

16. C. PSAMMOPHILA, *Harms in Baum, Kunene-Sambesi Exped.* 255 (1903).

Annua vel perennis, minute adpresse pubescens, circ. 1 met. alt. *Caulis* erectus, ramosus. *Folia* linearia vel lineari-oblanceolata, 23–55 mm. longa, 2–4 mm. lata, supra, glabra, subtus minute pubescentia, petiolo 3–6 mm. longo prædita. *Pedicelli* 3–5 mm. longi. *Bracteæ* lineares, ad basin pedicelli positæ. *Bracteolæ* lineares, ad basin calycis adnatæ. *Vexillum* circ. 7 mm. longum, externe subpurpureum. *Alæ* carina breviores. *Carina* stipitatum, naviculariformis, apice in rostrum attenuata, ±8 mm. longa. *Legumen* oblongo-globosum, demum glabrum, cum stipite 12–13 mm. longum.

ANGOLA: Kampuluve, *Baum* No. 741! Hbb. Mus. Brit., Berol., etc.; Kuebe Monongue, *Gossweiler* No. 2638! Kassuango Kuiri, *Gossweiler* No. 3574! No. 3685! Hb. Mus. Brit.

17. C. SPARTEA, [*Planchon MS. in Herb. Mus. Brit.*]; *R. Br. ex Baker in Oliver, Fl. Trop. Afr.* ii. 12 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 196, non *De Wild.*

Annua, ramosa. *Caules* graciles, erecti vel adscendentes, pubescentes. *Stipulæ* parvæ, setaceæ. *Folia* lineari-lanceolata vel linearia, usque ad 75 mm. longa vel interdum longiora, petiolo circ. 2 mm. longo suffulta.

Flores parviusculi, in racemos laxos 6–12-floros dispositi. *Pedicelli* 2–3–5 mm. longi. *Bracteæ* ad basin pedicelli, lineares. *Bracteolæ* lineares, circ. 2 mm. longæ, ad basin calycis adnatæ. *Calyx* circ. 4 mm. longus, dentibus triangularibus acutis. *Vexillum* purpureo-flavum, 7 mm. longum. *Alæ* carina breviores. *Carina* 8–9 mm. longa, apice acuta, naviculariformis, lineis notata. *Legumen* oblongo-cylindricum, sessile, 15–18 mm. longum, glabrum.

SIERRA LEONE : *Afzelius* ! Hb. Mus. Brit.

CONGO REGION : Nieuwdorp, *J. Bequaert* No. 420 ! Hb. Brux.

ANGOLA : Huilla, *Welwitsch* No. 1948 ! Malange, *Gossweiler* No. 1333 ! Hb. Mus. Brit., etc.

NYASALAND : *Buchanan* (1891) No. 544 ! (1891) No. 323 ! Hb. Kew.

This species is wrongly attributed to Robert Brown in the 'Flora of Tropical Africa.'

Easily distinguished from *C. glauca*, Willd., with which it has been confused, by the shape of the carina, etc.

Series 10. Flores in capitula dispositi. Carina 7–8 mm. longa. Herba procumbens, pilis patulis ferrugineis vestita, foliis ovatis, rotundatis vel oblongo-lanceolatis.

18. C. ANTHYLLOPSIS, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 15 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 197 ; *De Wild. Note sur la Fl. de Katanga*, 52.

Herba, caule patentim ramoso. *Stipulæ* lineares. *Folia* sæpius 50–95 mm. longa, petiolo 4–10 mm. longo prædita. *Flores* flavi vel albo-flavescentes. *Bracteolæ* ad basin calycis lineares. *Pedicelli* pilis ferrugineis vestiti. *Calycis laciniæ* angustæ. *Vexillum* obovatum, lineatum. *Alæ* unguiculatæ, 8–9 mm. longæ. *Carina* dorso rotundata. *Legumen* sessile, oblongum, dense sericeum, 2–3-spermum.

ABYSSINIA : *Schimper* (1863–68) No. 1454 ! Hbb. Kew., Berol.

CONGO REGION : Lukoma, *Kässner* No. 2700 ! and No. 2704 ! Hb. Mus. Brit.

ANGOLA : Pungo Andongo, *Welwitsch* No. 1943 ! Huilla, *Welwitsch* No. 1942 ! Hb. Mus. Brit. ; *Dekindt* No. 30 ! and No. 32 ! Hb. Mus. Paris ; *Hoffman* No. 50 ! Hb. Berol. ; N'Bango near Malange, *Gossweiler* No. 1351 ! Hb. Mus. Brit.

NYASALAND : *Buchanan* (1891) No. 303 ! No. 453 ! No. 884 ! Hb. Kew. ; Shire Highlands, *Buchanan* (1881) No. 447 ! Hb. Kew. ; British Central Africa, *K. J. Cameron* ! Hb. Kew.

Series 11. Flores in racemos elongatos sæpius 10–30-floros dispositi. Carina 6–10 mm. longa. Caules erecti, virgati, foliis linearibus vel lanceolatis pubescentibus vel pilis patentibus obtectis.

19. C. FILIFOLIA, *De Wild. Ann. Mus. Congo, Bot.* sér. v. i. (1906) 256, tab. 45. figs. 1–2.

Caulis erectus, tenuis, pubescens. *Rami* subangulares, pubescentes. *Stipulæ* parvæ, setaceæ. *Folia* 5–6·5 cm. longa, circ. 1 mm. lata, pubescentia, petiolo 5–6 mm. longo instructa. *Bracteæ* ad basin pedicelli, parvæ. *Bracteolæ* parvæ, basi calycis adnatæ. *Flores* in racemos circ. 12-floros laxos dispositi. *Calyx* 5 mm. longus. *Vexillum* ovale, circ. 6 mm. longum et latum. *Alæ* falciformi-oblongæ. *Carina* dorso rotundata, falciformis, apice obtusa. *Ovarium* hirtum, lineari-oblongum, circ. 6-ovulatum. *Legumen* ignotum.

CONGO REGION: Haut Congo, *Capt. Descamps*, Hb. Brux.

This species is allied to *C. Vogelii*, Benth.

20. C. VOGELII, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 561; *Baker in Oliver, Fl. Trop. Afr.* ii. 14.

Caules erecti, 7–10 dm. alti. *Rami* erecto-patentes, pilis patentibus tecti. *Stipulæ* parvæ. *Folia* linearia vel lineari-lanceolata, 3–8 cm. longa, 2–7 mm. lata, utrinque pubescentia, petiolo 2–4 mm. longo suffulta. *Racemi* elongati, 5–30-flori. *Calyx* sericeus; laciniæ lanceolatæ vel inferiores lineares. *Vexillum* obovatum, flavum, lineis purpureis notatum. *Alæ* angustæ. *Carina* dorso anguio fere recto curvata, inde in rostrum sensim attenuata, in toto 7–10 mm. longa. *Legumen* lineari-oblongum, brevissime stipitatum, circ. 9–14 mm. longum sericeum, 8–12-spermum.

NIGERIA: Stirling on the Quorra, *Vogel* No. 158! Nupe, *Barter* No. 992! N. Nigeria, *Dalziel* No. 17! Hb. Kew.

TOGOLAND: Kete Kratschy, *Zech.* No. 192! Hb. Berol.

DJURLAND: *Schweinfurth* No. 2377! and No. 2377 *bis*! Hbb. Berol., Turic., etc.

CONGO REGION: Boma, *Chevalier* No. 5953! Hb. Kew.

21. C. KARAGWENSIS, *Taubert in Engler, Pflanzenwelt Ost-Afr.* C. 204 (1895).

Annua, erecta, superne ramosa; caules superne striati, tenuiter angulati, adpresse pilosi. *Stipulæ* 2–3 mm. longæ. *Folia* lanceolata, 4–5 cm. longa, vel longiora, 6–7 mm. lata, subtus sericeo-pubescentia; petioli usque ad 2 mm. longi. *Flores* parviusculi, in racemum 10–25-florum dispositi. *Bracteæ* setaceæ, circ. 2 mm. longæ, pedicello $\frac{1}{3}$ breviores. *Bracteolæ* setaceæ, calyci adnatæ. *Calyx* extus pubescens, totus circ. 4 mm. longus, dentibus subulatis tubo 2-plo longioribus. *Vexillum* calycem 2-plo superans,

dorso sericeum. *Carina* dorso rectangulari-curvata, 6–7 mm. longa. *Ovarium* sericeo-villosum. *Legumen* deest.

GERMAN EAST AFRICA: West Karagwe, *Stuhlmann* No. 1972! Hb. Schweinfurth.

22. C. LINEARIFOLIA, *De Wild. in Ann. Mus. Congo, Bot.* sér. v. i. (1906) 257, tab. 45. figs. 3–9.

Caulis erectus, ramosus. *Rami* subangulares, indumento ferrugineo induti. *Stipulæ* setaceæ, parvæ. *Folia* linearia, circ. 7–9 cm. longa, et 3 mm. lata, petiolo circ. 5 mm. longo instructa. *Flores* in racemos circ. 8–10-floros laxos dispositi. *Bracteæ* parvæ. *Bracteolæ* ad basin calycis adnatæ, parvæ. *Calyx* 5–6 mm. longus, dentibus tubo subæquilongis acutis. *Vexillum* circ. 10 mm. longum et 7 mm. latum. *Alæ* vexillo breviores, circ. 3 mm. latæ. *Carina* dorso rotundata, uncinata. *Legumen* ignotum.

CONGO REGION: Lualaba, *Capt. Descamps*! Hb. Brux.

23. C. PARSONSII, *Bak. fil. in South Nigerian Plants*, 24 (1913).

Caulis erectus, ramosus, 1·3–1·6 m. altus, teres, hirsutus. *Stipulæ* angustæ, lineares. *Folia* lineari-lanceolata, apice mucronata, 6–8 cm. longa, 5–11 mm. lata, adpresse pilosa, costa subtus conspicua, petiolo communi 2–4 mm. longo instructa. *Flores* lutei, in racemos elongatos terminales et laterales dispositi. *Bracteæ* angustæ, pedicellis longiores. *Calycis* tubus hirsutus, dentibus brevibus. *Vexillum* luteum, lineis brunneis notatum. *Carina* dorso angulo recto curvata, in toto 8–9 mm. longa. *Ovarium* lineare. *Legumen* ignotum.

NIGERIA, River Benue, *P. Talbot* No. 449! Hb. Mus. Brit.; Lokoja, *A. C. Parsons* No. L. 38! Hb. Kew.

Closely allied to *C. Vogelii*, Benth. and *C. linearifolia*, De Wild. It differs from the former by its shorter calyx-teeth and from the latter by the broader leaves and acute, not blunt, apex of the carina.

Series 12. Flores laxe spicati. Carina naviculariformis. Caulis herbaceus, foliis oblongis vel oblongo-lanceolatis.

24. C. LEPRIEURII, *Guill. & Perr. Fl. Seneg. Tent.* i. 162 (1832); *Baker in Oliver, Fl. Trop. Afr.* ii. 14.

Caulis 5–6 dm. altus, simplex, breviter hirsutus. *Stipulæ* nullæ. *Folia* utrinque hirsuta, canescente-viridia, breviter petiolata. *Flores* flavidi, parvi. *Calyx* 5-fidus, extus hirsutus, segmentis lanceolatis fere æqualibus. *Vexillum* oblongo-ovale, circ. 6 mm. longum, flavidum, striatulum. *Alæ* vexillo dimidio minores. *Carina* alis paullo longior, rostriformis, flavescens. *Legumen* erectum, subcylindricum, 12 mm. circ. longum, sessile, canescens, ±26-spermum.

SENEGAMBIA: Walo, *Leprieur*.

I was not able to find the type of this species in the Paris Herbarium, and have therefore had to rely on the original description.

Series 13. Flores parvi, in racemum densum multiflorum dispositi. Carina 7–8 mm. longa, dorso angulo recto curvata, inde in rostrum longum attenuata. Caulis erectus, foliis oblongis vel lanceolato-oblongis.

25. C. KIPANDENSIS, *Bak. fil.*, sp. nov.

Caulis simplex vel rarius ramosus, teres, 2–6 dm. altus, plus minusve villosus. *Stipulæ* subnullæ. *Folia* plus minusve villosa, 2–3 cm. longa, 5–8 mm. lata, petiolo 2–5 mm. longo instructa. *Racemus* terminalis, multiflorus, 2–12 cm. longus. *Bracteæ* lineares, villosæ, pedicellis longiores. *Pedicelli* nunc breves, nunc 3–4 mm. longi. *Calyx* villosus, in toto 7–8 mm. longus, tubo 2–3 mm. longo, lobis lanceolatis ±5 mm. longis. *Legumen* nunc subglobosum, nunc oblongo-globosum, 6–8 mm. longum, sessile, villosum, oligospermum.

CONGO REGION: Kipanda, *Kässner* No. 2698! Hbb. Mus. Brit., Turic.

NYASALAND: Shire Highlands, dry stony situations, *Buchanan* No. 337! Hb. Kew.; Tanganyika Plateau, Fort Hill, alt. 1170–1330 metr., *Whyte*! Hb. Kew.

RHODESIA: Broken Hill, alt. 1330 metr., in flower May 1909, *Rogers* No. 8151! Hb. Kew.; near Mumbwa, *Mrs. Macaulay* No. 672! Hb. Kew.

An annual with a terminal raceme of flowers, allied to *C. passerinoides*, Taubert, but with broader leaves and longer villose calyx.

Series 14. Flores in racemos laxos sæpius 12–16-floros dispositi. Carina dorso angulo recto curvata, in toto 8–9 mm. longa. Folia oblonga vel oblongo-elliptica, superiora linearia.

26. C. TENUIPEDICELLATA, *Bak. fil.*, sp. nov.

Annua erecta. *Caulis* simplex, teres, 50–60 mm. longus, sparse pubescens. *Stipulæ* parvæ. *Folia* inferiora 18–24 mm. longa, 3–4 mm. lata, superiora, subtus pubescentia, 22–26 mm. longa, 1–2 mm. lata, petiolo 2–2·5 mm. longo prædita. *Flores* in racemos dispositi et nonnunquam subpaniculati. *Bracteæ* lineares, pedicellis breviores. *Calyx* in toto circ. 3 mm. longus, ad medium fissus; lobi triangulares, acuti. *Vexillum* lineis purpureis notatum, calyce circ. 4-plo longius. *Carina* apice in rostrum acuminatissimum apice sursum flexum sensim attenuata. *Ovarium* breviter stipitatum, pauciovulatum.

CONGO REGION: Kundelungu, *Kässner* No. 2757! Loanza, Lake Moero, *Kässner* No. 2814 *b*! Hb. Mus. Brit.

Noticeable on account of the terete stem, with oblong or oblong-elliptical lower leaves, narrow upper leaves, and a lax raceme of flowers on very slender pedicels. The calyx is short.

Series 15. Flores in racemos multifloros laxos dispositi. Carina dorso angulo recto curvata, inde in rostrum rectum attenuata, in toto 8–9 mm. longa. Annua foliis ellipticis, superioribus angustioribus.

27. C. MORUMBENSIS, *Bak. fil.*, sp. nov.

Annua. *Caulis* erectus, teres, 90–100 cm. altus, præcipue sursum pilis adpressis obtectus. *Stipulæ* parvæ, lineares. *Folia* inferiora elliptica vel ovato-elliptica, subtus pubescentia, 25–40 mm. longa, 10–13 mm. lata, superiora linearia vel oblongo-linearia, 40–50 mm. longa, 3–5 mm. lata, petiolo 1–1·5 mm. longo prædita. *Flores* in racemos 20–30-floros laxos dipositi. *Bracteæ* lineares, pedicellis longiores. *Calyx* hirsutus, 4–5 mm. longus, laciniis lanceolatis. *Vexillum* lineatum, 8–9 mm. longum. *Legumen* sessile, oblongo-globosum, circ. 5 mm. longum, calyce 2–3-plo longius, 1–2-spermum.

CONGO REGION: Mt. Morumben, *Kässner* No. 2939! Hbb. Mus. Brit., Berol., Turic. In flower 5 Feb. 1908.

Series 16. Flores pauci. Carina dorso angulo recto curvata, inde in rostrum attenuata, in toto circ. 12–14 mm. longa. Annuæ humiles.

28. C. SENGENSIS, *Bak. fil.*, sp. nov.

Annua, sparse pubescens, ramosa. *Stipulæ* lineares. *Folia* angustissima, apice acuta, 25–30 mm. longa, pubescentia. *Bracteæ* lineares, pedicello breviores. *Pedicelli* pubescentes. *Flores* pauci. *Bracteolæ* lineares, ad apicem pedicelli positæ. *Calyx* in toto circ. 7 mm. longus, extus pubescens; dentes angusti, circ. 4–5 mm. longi. *Vexillum* in sicco flavum. *Alæ* oblongæ. *Carina* dorso angulo recto attenuata, inde in rostrum attenuata, circ. 12 mm. longum. *Legumen* deest.

CONGO REGION: Mt. Senga, *Kässner* No. 2770! Hb. Mus. Brit.

This plant has very narrow leaves, few flowers, and a keel about 12 mm. long.

29. C. RUPICOLA, *Bak. fil.*, sp. nov.

Annua. *Caulis* teres, erectus, gracilis, ±8–10 cm. altus, pubescens. *Stipulæ* obsoletæ. *Folia* angustissima, 3–3·8 cm. longa, subteretia, apice acuta, pubescentia. *Flores* pauci. *Bracteæ* lineares. *Bracteolæ* 2, subteretes, apicem versus pedicelli positæ. *Pedicelli* circ. 3 mm. longi. *Calyx* pubescens, 9–10 mm. longus; laciniæ lanceolatæ, acuminatæ, 5–6 mm. longæ. *Vexillum* ellipticum, unguiculatum, cum ungue circ. 17 mm. longum, circ. 11 mm. latum. *Alæ* circ. 10 mm. longæ. *Carina* dorso rotundata, apice in rostrum brevem attenuata, circ. 14 mm. longa. *Ovarium* lineari-oblongum, pubescens, stipitatum. *Legumen* deest.

CONGO REGION: Mt. Senga, *Kässner* No. 2976! Hb. Mus. Brit.

The noticeable features of this plant are the slender, terete stem, 8–10 cm.

high, the very narrow, subsessile leaves, the few flowers, and the rostrate carina, which is about 14 mm. long.

Series 17. Inflorescentia 3–4-flora. Carina dorso rotundata, circ. 12–14 mm. longa. Caulis erectus, angulatus, glaber, foliis ellipticis vel ovali-ellipticis.

30. C. CORNETII, *Taub. et Dewèvre in Bull. Soc. Bot. Belg.* xxx. II. (1894) 99 nomen ; *l. c.* xxxiv. (1895) 94 ; *Th. Durand et Schinz, Etud. Fl. Congo*, 50 ; *De Wild. Fl. Katanga*, 50.

Caulis erectus. *Stipulæ* nullæ. *Folia* crassiuscula, 18–24 mm. longa, 11–13 mm. lata, inter congeneres insignia, basi rotundata vel leviter cordata, petiolo ±1 mm. longo prædita. *Flores* majusculi. *Pedicelli* glabri, 11–12 mm. longi. *Bracteæ* lineares. *Calyx* glaber ; laciniæ lanceolatæ. *Vexillum* ovato-reniforme, circ. 14 mm. longum. *Alæ* obovales, ±12 mm. longæ, et ±7 mm. latæ. *Carina* in rostrum longiusculum attenuata. *Ovarium* glabrum. *Legumen* deest.

CONGO REGION : Katanga, *Cornet* ; Lukafu, *Verdick*, Hb. Brux. ; Kundelungu, *Kässner* No. 2779 ! Hbb. Mus. Brit., Turic.

I have not seen the pod of this plant, and the calyx rather recalls that of a species of *Rafnia*.

Series 18. Flores pauci, in racemos laxos dispositi. Carina dorso angulata, 11–15 mm. longa. Herbaceæ, erectæ, caule alato vel insigniter angulato.

31. C. HOLOPTERA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 13 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 196.

Annua, glabra, ramosa. *Caules* erecti, rigidi, late bialati. *Stipulæ* angustæ, rigidæ. *Folia* pauca, sessilia, oblonga, elliptica vel oblanceolata, 3·5–10 cm. longa, 12–16 mm. lata. *Bracteæ* rigidæ, lineares. *Pedicelli* patuli, 6–8 mm. longi. *Vexillum* carina brevius. *Alæ* flavicantes, carina breviores. *Carina* flavicans, apice in rostrum attenuata. *Legumen* oblongum, 18–25 mm. longum, brevissime stipitatum glabrum, 10–12-spermum.

ANGOLA : Pungo Andongo, *Welwitsch* No. 1945 ! Cananbua, Malange, *Gossweiler* No. 1376 ! Hb. Mus. Brit.

32. C. STENOPTERA, *Welw. ex Baker in Oliver, l. c.* ii. 12 (1871) ; *Hiern, Cat. Welw. Afr. Pl.* i. 196 ; *Harms in Baum, Kunene-Sambesi Exped.* 256.

Caulis erectus, virgatus, glaber, anguste 4-alatus. *Stipulæ* rigidæ, angustæ. *Folia* subsessilia, lineari-lanceolata, apice mucronata, 7·5–9·5 cm. longi,

5–10 mm. lata, pallide viridia, glabra. *Flores* lutei, violaceo picti, 3–5 in racemum longum terminalem dispositi. *Bracteæ* lineares, minutæ. *Calyx* glaber, dentibus lanceolatis. *Vexillum* carina brevius. *Alæ* oblongæ, carina breviores. *Carina* dorso angulo recto curvata apice in rostrum rectum attenuata. *Legumen* oblongum, sessile, 2–2·8 cm. longum, glabrum, 12–15-spermum.

ANGOLA: Huilla, *Welwitsch* No. 1946! between Lassingua and Kuiriri, *H. Baum* No. 677! Hb. Mus. Brit., etc.

Var. nov. LATIFOLIA, *Bak. fil.*

Folia glabra, glauco-viridia, oblonga, oblongo-ovata vel elliptica, 4–4·5 cm. longa, 18–25 mm. lata.

ANGOLA: Kassuango, *Gossweiler* No. 3694! and No. 3360! Hb. Mus. Brit.

33. C. ANGULICAULIS, *Harms in Baum, Kunene-Sambesi Exped.* 253 (1903).

Caulis erectus, angulatus, usque ad 1–1·6 m. altus adpresse, pubescens. *Stipulæ* parvæ. *Folia* glauca, lanceolata vel linearia, 10–17 cm. longa, trinervia vel subtrinervia, glabrescentia, petiolo 1–2 mm. longo suffulta. *Racemi* pluriflori vel multiflori, axillares et terminales. *Flores* violacei. *Pedicelli* tenues. *Bracteæ* ad basin pedicelli parvæ. *Bracteolæ* parvæ, infra vel circa medium pedicelli positæ. *Calyx* adpresse pubescens, circa ad medium 5-dentatus. *Vexillum* extus strigoso-pubescens. *Alæ* carina breviores. *Carina* dorso angulo recto curvata, strigoso-pubescens, circ. 11 mm. longa. *Legumen* oblongum, cum stipite brevissimo 15–18 mm. longum.

ANGOLA: Kampuluve, *Baum* No. 740! Hb. Berol.; Lassingua, *Gossweiler* No. 3378! Kassuango, Kuiriri, *Gossweiler* No. 4049! and No. 3695! between the Lassingua and the Kuartiri, *Gossweiler* No. 4036! Hb. Mus. Brit.

Series 19. Flores lutei, in racemos laxe plurifloros dispositi. Carina dorso angulo recto curvata inde in rostrum longum et rectum sensim attenuata, in toto 12–18 mm. longa. Suffrutices virgati.

34. C. VIRGULTALIS, *Burch. in DC. Prod.* ii. 128 (1825); *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 561; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 40; *Schinz in Mém. Herb. Boiss.* no. 1, 131.

C. spartioides, E. Meyer, Com. i. 23, *non* DC.

Radix crassa, lignosa. *Rami* virgati, glabri vel minute sericei. *Stipulæ* nullæ. *Folia* pauca, crassiuscula, anguste oblonga vel lanceolato-linearia, obtusa vel acuta, 20–25 mm. longa, petiolo 2–3 mm. longo prædita. *Racemi* 4–10-flori. *Bracteæ* bracteolæque minutæ. *Calyx* appresse sericeus, pedi-

cello longior. *Petala* flava. *Vexillum* sericeum. *Alæ* oblongæ. *Carina* 12–15 mm. longa. *Legumen* sessile, elliptico-oblongum, 11–18 mm. longum, minute pubescens.

HEREROLAND: Nesob, *Dr. Fleck* No. 259! Hb. Turic.; Karribib River, *Dr. Range* No. 759! Hb. Turic.; Sandverhaar, *Dinter* No. 1179! Hb. Berol.

GREAT NAMAQUALAND: On the Gariep near Veleptram, *Drege*! Hb. Mus. Brit.; *Pappe* No. 68! *Wyley*! Inachab, *Dinter* No. 1146! Hb. Turic.; Oabitgarub, Orange River, *Schenck* No. 272! Rehoboth, *Dr. Fleck* No. 451! Hb. Turic.; Warmbad, *Dr. Fleck* No. 445! Hb. Turic.; Orange River, *Dr. Fleck* No. 446! Hb. Turic.; Aris Drift, Orange River, *Schenck* No. 265! Hb. Turic.

GRIQUALAND WEST: Between the left bank of Vaal River and the right bank of Riet River, *Burchell* No. 1752! Hb. Kew.

35. C. SPARTIOIDES, *DC. Prod.* ii. 128 (1825); *Benth. in Hook. Lond. Journ. Bot.* ii. 561; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 40.

Suffrutex copiose ramosus, erectus, 6–10 dm. altus. *Rami* virgati, striati, glabri vel minute sericei. *Stipulæ* nullæ. *Folia* pauca, lineari-subulata vel setacea, 25–40 mm. longa. *Racemi* elongati, distanter pluriflori. *Bracteæ bracteolæque* minutæ. *Flores* quam ii *C. virgultalis* paullo majores. *Calyx* pedicello brevior; lobi magis acuminati. *Vexillum* flavum, lineis striatis notatum. *Alæ* angustæ, carina breviores. *Carina* 13–18 mm. longa. *Legumen* breviter oblongum, subsessile, 10–15 mm. longum, glabrum vel minute puberulum.

RHODESIA: Victoria Falls, *C. F. Allen* No. 226! Hb. Kew.

BECHUANALAND: Chooi Desert, *Burchell* No. 2336! between Moshowing River and Kuru, *Burchell* No. 2407! Hb. Kew.

TRANSVAAL: Matebe Valley, *Holub*! Hb. Kew.

ZULU COUNTRY: *Miss Owen*! Hb. Kew.

KALAHARI DESERT: *Lieut. Lugard* No. 232! Hb. Kew.

ORANGE FREE STATE: Rhinoster River, *Burke & Zeyher*! Hb. Mus. Brit.; *Pappe* No. 69! Hb. Mus. Brit.

Series 20. Flores in racemos terminales et laterales multifloros dispositi. Carina dorso rotundata, circ. 15–17 mm. longa. Suffruticosa, foliis cuneato-oblongis.

36. C. RETUSA, *Linn. Sp. Pl.* 715 (1753); *DC. Prod.* ii. 125; *Bot. Mag.* t. 266; *Bot. Reg.* t. 253; *Baker in Oliver, Fl. Trop. Afr.* ii. 13; *Taubert in Engler, Pflanzenwelt Ost-Afr.* C. 204.

Suffrutex. *Caulis* erectus, 1–1·3 m. altus. *Rami* striati. *Stipulæ* minutæ,

subulatæ. *Folia* oblanceolato-oblonga vel oblongo-obovalia, obtusa, basi cuneata, sæpius 40–75 mm. longa, 13–28 mm. lata, superne glabra, subtus puberula, petiolo brevi suffulta. *Racemi* 10–20-flori, laxi. *Bracteæ* ad basin pedicelli parvæ. *Calycis* lobi lanceolati, tubo duplo longiores. *Vexillum* flavum, vel purpurascens. *Carina* apice breviter rostrata, in toto 14–17 mm. longa. *Legumen* oblongum, breviuscule stipitatum vel subsessile, 35–40 cm. longum, glabrum, 15–20-spermum.

Widely distributed in Tropical Africa, also in Comoro Is., Rodriguez, Madagascar, India, Ceylon, China, Malaya, N. Australia, America. This is the *Crotalaria asiatica, folio singulari cordiformi, floribus luteis* of Hermann (Hort. Acad. Lugduno-Batavus, p. 201). There are several specimens in the Hermann Herbarium.

Series 21. Flores pauci, magni, in ultimorum foliorum axillis dispositi. Carina calyce brevior, 18–22 mm. longa. Herba pilis ferrugineis dense vestita.

37. C. CALYCINA, *Schrank, Pl. Rar. Hort. Monac.* t. 12 (1819); *DC. Prod.* ii. 129; *Baker in Oliver, Fl. Trop. Afr.* ii. 15; *Hiern, Cat. Welw. Afr. Pl.* i. 197.

Herba simplex vel ramosa, caule gracili erecto. *Stipulæ* parvæ, oculo nudo vix conspicuæ. *Folia* brevissime petiolata, linearia, lineari-lanceolata vel oblongo-lanceolata, 5–7 cm. longa, 6–10 mm. lata, undique pellucido-punctata, pilis ferrugineis præcipue subtus vestita. *Calyx* profunde bilabiatus, extus longe denseque strigoso-pilosus, corollam obtegens, sæpe 20–25 mm. longus. *Carina* albido-virescens. *Legumen* glabrum, calyce parum aucto involucratum, paullo inflatum, 12–30-spermum.

SENEGAMBIA: *Heudelot* No. 119! Hb. Kew.; *Lecard* No. 278! Hb. Berol.

SIERRA LEONE: Luseniya, *Scott Elliot* No. 4066! Hb. Kew.

NIGERIA: Yola, *Dalziel* No. 1! Hb. Kew.

CAMEROONS: *Ledermann* No. 3939! Hb. Berol.

DJURLAND: Seriba Ghattas, *Schweinfurth* No. 2325! Hb. Kew.; No. 3133! Hb. Schweinfurth.

UGANDA: Unjoro Plateau, *Speke & Grant* No. 573! Hb. Kew.; Mt. Ruwenzori, Semliki Valley, *Scott Elliot* No. 8072! Hb. Kew.

CONGO REGION: Dembo, *J. Bequaert* No. 483! Hb. Brux.

ANGOLA: Pungo Andongo, *Welwitsch* No. 1937! Hb. Mus. Brit.; *Mechow* No. 70! and No. 130! Hb. Schinz; near Lucollo, *Gossweiler* No. 1380! Hb. Mus. Brit.; Angola, *Mr. & Mrs. Monteiro*! Hb. Kew.

GERMAN EAST AFRICA: Undussuma, *Stuhlmann* No. 2608! Hb. Schweinfurth.

ZANZIBAR: *Kirk*, Hb. Kew.

NYASALAND: *Buchanan* (1895) No. 394! Hb. Kew.; S.W. Nyasaland, Kagehi, *Stuhlmann* No. 3477! Hb. Schweinfurth.

PORTUGUESE EAST AFRICA: Lion's Creek, *Schlechter* No. 12210! Hbb. Kew., Turic.

A common Asiatic species reaching China and N. Australia.

Series 22. Flores in racemum laxissimum 2–4-florum dispositi. Carina circ. 17–18 mm. longa. Annua, foliis lineari-lanceolatis.

38. C. BOEHMII, *Taubert in Engler, Pflanzenwelt Ost-Afr.* C. 204 (1895).

Annua, erecta, fere e basi parce ramosa, usque ad 30–35 cm. alta, adpresse sericea, mox glabrescens. *Caulis* teres vel subteres. *Rami* suberecti. *Stipulæ* minutæ. *Folia* lineari-lanceolata vel lanceolata, apice acuminata, 6–10 cm. longa, circ. 10–11 mm. lata, superne primum parce pilosa, mox glabra, petiolo 2–3 mm. longo suffulta. *Flores* majusculi, pedicellati. *Bracteæ* circ. 1 mm. longæ. *Pedicelli* circ. 5 mm. longi. *Calyx* totus circ. 10 mm. longus, dentibus lanceolatis 7–8 mm. longis tubo subtriplo longioribus. *Vexillum* oblongum, hamato-apiculatum, dorso sub apice vix pilosum, lineis purpureis insigniter striatum. *Alæ* oblique oblongæ. *Carina* cymbiformis, longe rostrata, marginibus villosulo-ciliatis. *Ovarium* stipitatum, præter latus ventrale densiuscule fusco-pubescens glabrum. *Legumen* deest.

UGANDA: River Wala, *Boehm* No. 88! Hbb. Berol., Turic.

A branched annual with lanceolate acuminate leaves, small stipules, and a lax raceme of 2–4 rather large flowers.

Series 23. Flores majusculi, in racemos longe pedunculatos laxe 3–9-floros dispositi. Carina dorso rotundata, 18–20 mm. longa. Caulis elongatus, flexuosus, angulatus.

39. C. WELWITSCHII, *Baker in Oliver, Fl. Trop. Afr.* ii. 13 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 196.

Caulis elongatus. *Stipulæ* lanceolatæ. *Folia* coriacea, ovata vel oblonga, basi rotundata vel cuneata, apice acuta et mucronata, 6–8 cm. longa, 2–4·5 cm. lata, superne glabra, subtus strigoso-pubescentia, petiolo 10–22 mm. longo suffulta. *Bracteæ* lanceolatæ. *Calyx* totus circ. 11 mm. longus; laciniæ tubo longiores, pubescentes. *Vexillum* suborbiculari-obovatum. *Alæ* late oblongæ, circ. 20 mm. longæ et ±9 mm. latæ. *Carina* apice acuta, aliis subæquilonga. *Legumen* oblongum, circ. 28 mm longum, glabrum, stipitatum.

ANGOLA: Pungo Andongo, between Quibunda and Quitage, *Welwitsch* No. 1938! Hb. Mus. Brit.; Benguella, Bailundo Distr., *Wellman*! Hb. Kew.

Series 24. Flores solitarii, longe pedicellati. Corolla haud visa. Caulis herbaceus, gracilis, procumbens, foliis sessilibus oblanceolatis.

40. C. UNIFLORA, *Baker in Oliver, Fl. Trop. Afr.* ii. 13 (1871).

Caulis teres, glaber, copiose ramosus. *Stipulæ* minutæ, setaceæ. *Folia* sessilia, 18–21 mm. longa, ±6 mm. lata, mucronata, basi subcuneata, glabra. *Flores* solitarii. *Pedicelli* oppositifolii, graciles, ±25 mm. longi et ultra, basin versus bracteolis setaceis instructi. *Calyx* glaber, ±6 mm. longus; lobi lanceolati, tubo brevi. *Legumen* distincte stipitatum, lineari-oblongum, leviter incurvum, 12–14 mm. longum, ±6 mm. latum, glabrum.

SENEGAMBIA: *Perrottet*, Hb. Mus. Paris.

Specimen not seen.

SECT. II. SPHÆROCARPÆ, Benth. in Hooker's Lond. Journ. Bot. ii. (1843) 579.

Flores parvi, in capitula vel in racemos vel apicem versus pedicellorum subumbellatim dispositi vel rarius solitarii vel in axillis foliorum. Carina calyce sæpius longior. Herbæ vel suffrutices, rarissime fruticuli, haud spinosi, foliis sæpius trifoliolatis. Legumina globosa vel elliptico-globosa.

CLAVIS SPECIERUM.

1 (*a*)	Flores in capitula vel in racemos densos vel subdensos nec in foliorum axillis dispositi	2
(*b*)	Flores in capitula vel in racemos densos vel subdensos dispositi, et pauci quoque in foliorum axillis	15
(*c*)	Flores in racemos laxos non umbelliformes dispositi	22
(*d*)	Flores paniculatim dispositi	32
(*e*)	Flores in foliorum axillis dispositi, rarius superne racemosi	33
(*f*)	Flores in racemos subumbelliformes dispositi	36
(*g*)	Flores solitarii	37
(*h*)	Flores pauci, apicem versus caulium dispositi	38
2.	Flores parvi. Carina 4–6 mm. longa	3
	Flores majores. Carina 7–12 mm. longa	7
3.	Herbæ	4
	Suffrutices	6
4.	Calyx ± 3 mm. longus	*parvula.*
	Calyx 3·5–5 mm. longus	5
5 (*a*)	Procumbens. Foliola late obovata	*Baumii.*
(*b*)	Caules erecti vel adscendentes. Foliola cuneato-oblonga vel oblongo-lanceolata	*Kässneri.*
(*c*)	Caules erecti vel adscendentes. Foliola oblanceolata	*cephalotes.*
6.	Calycis lobi lanceolati vel triangulares. Carina dorso rotundata.	*abbreviata.*
	Calycis lobi lati	*Seemeniana.*
7.	Herbæ annuæ vel perennes	8
	Suffrutices	12

8.	Carina falcata. Legumen pilis brunneis dense obtectum	*vasculosa.*
	Carina dorso angulo recto curvata, inde in rostrum rectum sensim attenuata	9
9.	Plantæ sæpius 10–25 cm. altæ	10
	Plantæ altiores, 25–70 cm. vel ultra	11
10.	Foliola oblongo-obovata. Petioli ± 3–4 mm. longi	*Poggei.*
	Foliola oblonga vel oblanceolata. Petioli 4–8 mm. longi	*kutchiensis.*
	Foliola parva oblanceolata vel lineari-obovata. Petioli 3–4 mm. longi	*Jacksonii.*
11 (*a*)	Foliola lineari-lanceolata. Racemi densiusculi	*quangensis.*
(*b*)	Foliola oblongo-lanceolata vel oblonga. Racemi subdensi	*nutans.*
(*c*)	Foliola cuneato-oblonga. Racemi subdensi	*malangensis.*
(*d*)	Foliola cuneato-oblonga vel cuneato-obovata. Racemi densi .	*prolongata.*
12.	Carina dorso rotundata	*Fischeri.*
	Carina dorso angulo recto curvata vel genuflexa.............	13
13.	Carina ± 7 mm. longa..................................	*Ledermannii.*
	Carina 9–11 mm. longa	14
14 (*a*)	Foliola oblanceolata. Flores in capitula densa dispositi	*nyikensis.*
(*b*)	Foliola anguste lanceolata. Caules ramosi. Flores in capitula densa dispositi	*Descampsii.*
(*c*)	Foliola anguste lanceolata. Caules plures ex eadem radice orti, simplices. Flores in racemos densos vel subdensos dispositi .	*Sapinii.*
(*d*)	Foliola oblongo-elliptica. Legumen globoso-conoidea	*lepidissima.*
(*e*)	Foliola lineari-obovata. Legumen ellipsoideo-globosum	*adenocarpoides.*
(*f*)	Foliola cuneato-oblonga. Legumen oblique obovoideo-globosum.	*globifera.*
15.	Herbæ	16
	Suffrutices..	17
16.	Foliola cuneato-spathulata, 4–5 mm. lata	*hyssopifolia.*
	Foliola oblongo-spathulata, 4–8 mm. lata.	*Johnstonii.*
	Foliola anguste oblanceolata, 1–2·5 mm. lata.	*erythrophleba.*
	Foliola oblanceolata vel oblongo-oblanceolata, 2–4 mm. lata, ubique albido- vel flavo-tomentosa	*leucotricha.*
17 (*a*)	Suffrutices ramosi. Carina dorso rotundata, in calyce subabscondita	18
(*b*)	Suffrutices valde foliosi, caulibus sæpius simplicibus. Carina dorso genuflexa..	19
(*c*)	Suffrutex mediocriter foliosus. Calyx vexillo brevior	*Antunesii.*
18.	Foliola lanceolata, utrinque hirta. Valde foliosa	*abscondita.*
	Foliola oblanceolata, superne subglabra. Mediocriter foliosa ..	*cistoides.*
19.	Folia superiora simplicia, inferiora trifoliolata	20
	Folia sæpius omnia trifoliolata	21
20.	Petioli 1–3 mm. longi	*stenothyrsus.*
	Petioli circ. 15 mm. longi	*Seretii.*
21.	Foliola intermedia lateralia parum superantia	*benguellensis.*
	Foliola intermedia lateralia 1·5–3-plo superantia	*cuspidata.*
22 (*a*)	Annuæ vel perennes. Carina dorso angulo recto curvata, inde in rostrum rectum attenuata, in toto 5–7 mm. longa	23
(*b*)	Annua. Carina dorso rotundata, 5–7 mm. longa	26
(*c*)	Suffrutices, vel fruticuli vel rarissime plantæ annuæ vel perennes. Carina dorso rotundata, in toto 5–8 mm. longa ..	27

(*d*) Annuæ, perennes vel suffrutices. Carina dorso angulo recto curvata, inde in rostrum rectum sensim attenuata 29
23 (*a*) Glabra vel pubescens 24
(*b*) Squarrosa, hirta .... *squarrosa.*
(*c*) Foliola sparsa pilis albidis dense vestita .... *sparsifolia.*
24 (*a*) Legumina 2–3·5 mm. longa. Foliola angustissima .... *Carsonii.*
(*b*) Legumina 3·0–3·5 mm. longa. Foliola oblanceolata .... *tenuirama.*
(*c*) Legumina 3·5–5 mm. longa 25
25 (*a*) Foliola oblanceolata vel oblongo-obovata .... *sphærocarpa.*
(*b*) Foliola linearia vel cuneato-oblonga .... *sphærocarpa*, var. *angustifolia.*
(*c*) Foliola cuneato-oblanceolata vel cuneato-oblonga. Flores numerosi .... *graminicola.*
(*d*) Foliola oblanceolata vel cuneato-oblonga. Flores quam in *C. graminicola* laxiores .... *Lukomæ.*
26. Foliola linearia, in sicco nigrescentia........................ *filicaulis.*
27. Plantæ elatæ vel subelatæ 28
Fruticulus humilis, ramosus. Legumen late ellipsoideum, 2–3-spermum .... *dumosa.*
Perennis, circ. 12–15 cm. alta. Carina ± 8 mm. longa. Legumen globosum .... *boranica.*
28. Carina 6–8 mm. longa. Legumen 5–6-spermum .... *huillensis.*
Carina 7–8 mm. longa. Legumen oblique oblongum, 4-spermum. *dura.*
29. Annuæ, elatæ. Flores in racemos laxissimos dispositi. Carina 8–9 mm. longa 30
Suffrutices. Carina 7–13 mm. longa 31
30 (*a*) Foliola late linearia vel lineari-lanceolata, 30–45 mm. longa, 4–7 mm. lata, apice rotundata .... *cernua.*
(*b*) Foliola lanceolata, oblonga, vel late elliptica, apice emarginata, 20–32 mm. longa, 6–12 mm. lata .... *truncata.*
(*c*) Foliola anguste oblanceolata, 5–13 mm. longa, 0·5–1·5 mm. lata. *laxiflora.*
31. Carina 11–13 mm. longa .... *Leubnitziana.*
Carina 7–10 mm. longa .... *Dinteri.*
32 (*a*) Foliola oblanceolata vel oblongo-oblanceolata. Caules deorsum sulcati .... *florida.*
(*b*) Foliola oblonga vel oblongo-obovata. Caules deorsum non sulcati .... *acuminatissima.*
(*c*) Foliola lineari-obovata, supra granuloso-punctata .... *polyantha.*
(*d*) Foliola suprema lineari-oblonga, inferiora obovata .... *kundelunguensis.*
33 (*a*) Carina 4–5 mm. longa 34
(*b*) Carina 6–10 mm. longa 35
(*c*) Carina 12–13 mm. longa .... *phyllostachys.*
34. Petioli 5–10 mm. longi .... *Bequaertii.*
Petioli 2–3 mm. longi .... *Alexanderi.*
35 (*a*) Carina 6–7 mm. longa. Folia suprema simplicia, inferiora trifoliolata, usque ad 3–6 mm. lata .... *kuiririensis.*
(*b*) Carina 8–9 mm. longa ; carinæ rostrum apice sursum flexum .. *axilliflora.*
(*c*) Carina 7–8 mm. longa ; rostrum rectum .... *Mumbwæ.*
(*d*) Carina 9–10 mm. longa; rostrum rectum. Folia suprema simplicia, inferiora trifoliata .... *Elisabethæ.*

36 (*a*) Foliola obovata. Legumen sæpius 3-spermum. Carina 5–6 mm. longa .... *pisicarpa.*
(*b*) Foliola oblonga vel obovata-lanceolata. Legumen 1–2-spermum. Carina 6–8 mm. longa .... *pilulicarpa.*
(*c*) Foliola oblonga vel elliptica. Legumen sæpius 3-spermum. Carina sæpius 6 mm. longa .... *pilulicarpa,* var. *Schinzii.*
(*d*) Foliola obovata vel oblongo-obovata. Carina 9–11 mm. longa . *reptans.*
37. Planta humilis. Caulis 12–15 cm. longus. Foliola oblanceolata. *minima.*
38. Planta humilis. Caulis 4–10 cm. altus. Foliola obovata ...... *congoensis.*

Series 1. Flores in capitula vel in racemos densos dispositi. Carina 4–11 mm. longa. Herbæ vel suffrutices, foliis petiolatis.

41. C. PARVULA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 25 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 200.

Caules ex eadem radice orti plures, adscendentes vel procumbentes, 10–23 cm. longi. *Stipulæ* non conspicuæ. *Folia* trifolioliata, foliolis oblanceolatis vel oblongo-oblanceolatis 7–11 mm. longis 2–3·5 mm. latis strigoso-pubescentibus, petiolo communi 3·0–4·0 mm. longo suffulta. *Flores* parviusculi, e viridi flavescentes, sat insconspicui. *Racemi* ad apices caulium, 1·0–5·0 cm. longi. *Calyx* circ. 3 mm. longus, dentibus acutis. *Vexillum* circ. 4–5 mm. longum. *Carina* apice in rostrum attenuata, 4–5 mm. longa. *Legumen* subglobosum, sessile, circ. 2-spermum, demum glabrum (?).

ANGOLA: Huilla, *Welwitsch* No. 1971, Hb. Mus. Brit., etc.

42. C. KÄSSNERI, *Bak. fil.*, sp. nov.

Annua. Caules tenues, adscendentes, plures ex eadem radice orti, 12–18 cm. longi, hirsuti. *Stipulæ* non conspicuæ. *Folia* trifoliolata, foliolis cuneato-oblongis vel oblanceolatis lateralibus inæquilateralibus 6–10 mm. longis, intermediis 10–15 mm. longis 3·0–4·5 mm. latis strigoso-pubescentibus, petiolo communi hirsuto 3–6 mm. longo suffulta. *Flores* parviusculi, pedicellis hirsutis. *Calyx* dense hirsutus; lobi lanceolati. *Vexillum* extus plus minusve hirsutum, obovatum, 5–6 mm. longum, carina paullo longius. *Alæ* 5–6 mm. longæ. *Carina* naviculariformis vel cymbæformis, cum unguibus circ. 5 mm. longa, apicem versus sensim attenuata. *Legumen* globosum, pubescens, circ. 3-spermum.

CONGO REGION: Lukomo River, *Kässner* Nos. 2704! 2705! Hb. Mus. Brit.

A slender annual, with small flowers, in dense heads, at the ends of the stems.

43. C. CEPHALOTES, *Steud. ex A. Rich. Tent. Fl. Abyss.* i. 156 (1847); *Baker in Oliver, l. c.* ii. 22; *Hiern, Cat. Welw. Afr. Pl.* i. 199.

Caulis erectus, simplex vel ramosus, subtomentosus. *Stipulæ* nullæ. *Folia* trifoliolata, foliolis oblanceolatis 1–2 cm. longis 3–4 mm. latis tomen-

tosis, petiolo communi 5–12 mm. longo prædita. *Flores* parvi, flavescentes. *Bracteolæ* non conspicuæ. *Calycis tubus* ± 4 mm. longus ; laciniæ lanceolatæ, acutæ. *Vexillum* 4–5 mm. longum. *Alæ* oblongæ. *Carina* dorso rectangulari-curvata, apice in rostrum gracilem attenuata, 5–6 mm. longa. *Legumen* ovoideum, apice uncinatum, sessile, 4–5 mm. longum, dense sericeo-pubescens, 2–3-spermum.

NIGERIA : Nupe, *Barter*! Hb. Kew.

CAMEROONS : Posten Sagosche, *Ledermann* No. 3886 ! Hb. Berol.

ABYSSINIA : Near Dschaladscheranne, *Schimper* No. 695 ! *Quartin Dillon*, *Petit*, Hb. Paris.

UGANDA : Mulema, *Bagshawe*! Hb. Mus. Brit. ; Madi, *Speke & Grant*! Hb. Kew.

BRITISH EAST AFRICA : Masai, *Scott Elliot* No. 6849 ! Hb. Mus. Brit.

ANGOLA : Pungo Andongo, *Welwitsch* No. 1935 ! Huilla, *Welwitsch* No. 1936 ! Hb. Mus. Brit. ; Kulei and Kutsi, *Baum* No. 880 ! Hb. Berol. ; right bank of Cuanzi, *Gossweiler* No. 1338 ! Hb. Mus. Brit.

CONGO REGION : Bukoma, *J. Bequaert* No. 121 ! Hb. Brux. ; Sakania, *Rogers* No. 10026 ! Hb. Mus. Brit.

GERMAN EAST AFRICA : Kilimanjaro, *Volkens* No. 1789 ! Hb. Berol.

RHODESIA : Near Salisbury, *Rand* No. 463 ! p. p. Hb. Mus. Brit. ; Mazoe, *F. Eyles* No. 370 ! Hb. Mus. Brit.

TRANSVAAL : South African Gold Fields, *Baines*! Hb. Kew.

Var. nov. MOEROENSIS, *Bak. fil.*

Foliola quam ea typi angustiora, pilis patulis vestita, petiolis brevioribus. *Calyx* totus 3 mm. longus ; laciniæ triangulares. *Vexillum* ± 4 mm. longum. *Carina* apice in rostrum attenuata, 4–5 mm. longa.

CONGO REGION : Loanza, Lake Moero, *Kässner* No. 2812 ! Hb. Mus. Brit. In flower 18 May, 1908.

44. C. BAUMII, *Harms in Baum Kunene-Sambesi Exp.* 253 (1903).

Annua, caulibus procumbentibus puberulis vel adpresse pubescentibus. *Folia* parva, breviter petiolata, 3-folioliata, foliolis plerumque late vel latiuscule obovatis, lateralibus plerumque obliquis, apice rotundatis 5–9 mm. longis 4–7 mm. latis. *Racemi* terminales, pauciflori vel pluriflori, densi, breves, pedicellis brevissimis. *Bracteolæ* angustæ. *Calyx* 4–5 mm. longus, ultra medium 5-partitus. *Vexillum* dorso adpresse pubescens. *Carina* dorso angulo recto curvata, in toto circ. 6 mm. longa. *Legumen* suborbiculare, parvum, sæpe 2-spermum.

ANGOLA : Lassingua, *Baum* No. 836 ; Hb. Berol.; R. Kuartiri, *Gossweiler* Nos. 2634 ! 4064 ! Hb. Mus. Brit.

An annual or biennial, glaucous-green herblet with branches procumbent, radiately spreading from the centre. Inflorescence erect. Calyx pale

greenish and whitish, tomentellous. Standard whitish, wings violet, and keel pale yellow.

45. C. ABBREVIATA, *Bak. fil.*, sp. nov.

Planta perennis, subtomentosa. *Caulis* erectus, ramosus, basi lignosus, 25–34 cm. altus. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis obovatis vel oblongo-obovatis 8–15 mm. longis 5–6 mm. latis hirsutis, costa superne impressa, nervis tenuibus, petiolo 2–3 mm. longo superne canaliculato suffulta. *Flores* parviusculi, in racemos laterales densos dispositi. *Racemi* 10–23 mm. longi. *Bracteolæ* ad basin calycis lineares, hirsutæ, circ. 1 mm. longæ. *Calyx* hirsutus, totus 4 mm. longus; dentes triangulares, acuti, circ. 2 mm. longi. *Vexillum* calyce longius, obovatum, apice emarginatum, circ. 5 mm. longum. *Alæ* oblongæ. *Carina* dorso rotundata, falcata vel subfalcata, in toto circ. 5 mm. longa, rostro brevi. *Legumen* subsphæroideum, apice mucronatum, 5–6 mm. longum, dense fulvo-hirsutum, sæpe 2-spermum, seminibus lævibus pallide viridibus.

CONGO REGION: Lake Tanganyika shore, *Kässner* No. 3033! Hbb. Mus. Brit., Turic.

This plant has short, dense, lateral racemes of flowers and pods covered with brown hairs.

46. C. SEEMENIANA, *Harms in Engl. Jahrb.* xxx. (1901) 322.

Suffrutex ramosus, ramis elongatis teretibus virgatis subsericeo-pubescentibus vel puberulis. *Folia* satis parva, breviter petiolata, 3-folioliata, foliolis obovatis vel obovato-oblongis 9–12 mm. longis 3– 6mm. latis, supra glabris subtus sericeis vel subsericeis. *Pedicelli* in medio vel supra medium bracteolis linearibus geminis instructi. *Calyx* sericeus, dentibus late ovatis suborbicularibus vel semiorbicularibus obliquis. *Vexillum* obovato-suborbiculare, basi auriculatum, ± 7 mm. longum. *Ovarium* breviter stipitatum, breve, apice rostratum, sutura ventrali breviter pilosum.

GERMAN EAST AFRICA: Mt. Kieyo, *Goetze* No. 1170! Hbb. Berol., Kew.

Noticeable on account of the broad, rounded, short calyx-teeth.

47. C. POGGEI, *Taubert in Engl. Jahrb.* xxiii. (1896) 179.

Caules erecti, flexuosi, plures ex eadem radice orti, 15–25 cm. longi. *Folia* trifolioliata, foliolis oblongo-obovatis apice mucronulatis basi subcuneatis supra glabris subtus puberulis terminalibus 8–11 mm. longis 6–7 mm. latis, petiolo communi circ. 3 mm. longo. *Capitula* circ. 2 cm. longa. *Bracteæ* circ. 3–5 mm. longæ. *Pedicelli* parce puberuli bracteolis setaceis medio vel infra medium instructi. *Calycis* tubus circ. 1·5 mm. longus, dentibus 3·5 mm. longis. *Vexillum* calyce longius, circ. 7 mm. longum et ± 6 mm. latum. *Carina* circ. 7 mm. longa. *Ovarium* brevissime stipitatum, glabrum. *Legumen* ignotum.

CONGO REGION: On the Quango, *Pogge* No. 157! Hb. Berol.

The distinguishing features of this plant are the flowers in a head, the nearly glabrous calyx, the teeth being rather more than twice the length of the tube, and the glabrous ovary.

48. C. KUTCHIENSIS, *Bak. fil.*, sp. nov.

Radix lignosa. *Caules* ex eadem radice orti, 12–18 cm. longi, pubescentes, graciles. *Stipulæ* oculo nudo non conspicuæ. *Folia* trifoliolata, foliolis oblongis apice acutis busi cuneatis 12–18 mm. longis 4–6 mm. latis, petiolo communi 4–8 mm. longo suffulta. *Flores* lutei, in capitula dispositi. *Calyx* circ. 4 mm. longus, pubescens. *Vexillum* luteum, 7–8 mm. longum. *Carina* angulo recto curvata, in toto 8–9 mm. longa. *Legumina* sessilia, globoso-conoidea, pubescentia.—Ab *C. globifera*, E. Mey., differt statura humiliore, racemis brevioribus, leguminibus globoso-conoideis sessilibus.

ANGOLA: Kului, *Gossweiler* No. 2249! Hb. Mus. Brit.; River Kutchi, *Gossweiler* No. 3377! Between Kubango and Kutchi, *Gossweiler* No. 4200! Hb. Mus. Brit.

49. C. JACKSONII, *Bak. fil.*, sp. nov.

Annua. *Caulis* gracilis, teres, pubescens, 20–30 cm. alt., sursum foliosus, adspectu *C. Seemenianæ*, Harms. *Folia* satis parva, trifoliolata, petiolo communi 3–4 mm. longo prædita, foliolis oblanceolatis vel lineari-obovatis sæpissime 3–4 mm. longis 1–2 mm. latis superne glabris et nervo medio impresso subtus griseo-strigoso-pubescentibus. *Flores* in capitula terminalia aggregata. *Pedicelli* graciles. *Bracteolæ* sub calyce positæ. *Calycis tubus* brevis; laciniæ lanceolatæ, tubo longiores. *Vexillum* quam carina brevius, obovatum, unguiculatum, 6–7 mm. longum. *Carina* apice in rostrum producta, 8–9 mm. longa. *Legumen* ignotum.

BRITISH EAST AFRICA: Mau Forest, *F. J. Jackson*! Hb. Mus. Brit.

50. C. VASCULOSA, *Wallich, Cat.* No. 5427; *ex Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 584.

C. pseudoerisema, Vatke in Œst. Bot. Zeit. (1878) 178.

Caulis herbaceus, erectus. *Rami* elongati, virgati, hirsuti. *Stipulæ* setaceæ. *Folia* trifoliolata, foliolis oblongo-ellipticis vel ellipticis 15–65 mm. longis 8–20 mm. latis, petiolo 2–3 mm. longo prædita. *Racemi* terminales, elongati. *Flores* parvi, numerosi. *Calyx* hirtus, laciniis tubo vix longioribus. *Vexillum* obovatum. *Carinæ rostrum* falcatum, vexillo paullo longius; carina 7–9 mm. longa. *Legumina* oblonga vel globosa, ferrugineo-hirsuta, dense pilosa.

British East Africa: North of Mombassa to Lamu and Witu, *Whyte*! Hb. Mus. Brit.; Ribe, *Wakefield*! Hb. Kew.; Rabai, *Taylor*! Hb. Mus. Brit.; Nyika Country, *Wakefield*! Hb. Kew.

Uganda: *Scott Elliot* No. 7188! Hb. Mus. Brit.

Zanzibar: *Hildebrandt* No. 931! Hb. Mus. Brit.; *Stuhlmann* No. 882! Hb. Berol.

German East Africa: Usambara, *Holst* No. 8791!; Usaramo, *Stuhlmann* No. 8218! Hb. Berol.

Portuguese East Africa: Morumben, *R. Schlechter* No. 12103! Hb. Mus. Brit.

51. C. Ledermannii, *Bak. fil.*, sp. nov.

Caulis erectus, ramosus, 30–50 cm. altus. *Rami* virgati, subteretes. *Stipulæ* subnullæ. *Folia* trifoliolata, foliolis oblanceolatis 7–12 mm. longis 2·5–4·5 mm. latis subtus strigosis, petiolo 6–9 mm. longo instructa. *Flores* lutei, in capitula densa aggregati, pedicellis tenuibus. *Calyx* 3 mm. longus, externe pubescens, dentibus acutis tubo subæquilongis. *Vexillum* 4–5 mm. longum, in sicco luteum, striatum, extus, pubescens. *Alæ* oblongæ, cum ungue 4–5 mm. longæ. *Carina* dorso angulo fere recto curvata, inde in rostrum rectum attenuata, in toto ±7 mm. longa. *Legumen* subsphæroideum, 4–5 mm. longum.

Cameroons: Markt Singwe, Bambuttuberge, *Ledermann* Nos. 1717 and 1725! Hb. Berol.; Fossong Wendschen, *Ledermann* No. 1544! Hb. Berol.

This plant is allied to *C. nyikensis*, Baker; the flowers are aggregated in dense heads at the end of the stem and branches, but the flowers are distinctly smaller.

52. C. nyikensis, *Baker in Kew Bull.* (1897) 250.

Herba perennis vel suffrutex elatus, erectus, ramosus. *Rami* graciles, virgati, teretes, adscendentes, dense pubescentes. *Folia* foliolis oblanceolatis obtusis mucronatis 6–12 mm. longis 3–6 mm. latis pallide viridibus dense pubescentibus, petiolo pubescente 6–13 mm. longo suffulta. *Racemi* densi, globosi vel oblongo-globosi. *Bracteæ* parvæ, lineares, pilosæ. *Calyx* dense pilosus, totus circ. 5 mm. longus, dentibus lanceolatis. *Corolla* pallide rubella, calyce duplo longior. *Vexillum* oblongo-obovatum, carinæ subæquilongum, ± 9 mm. longum, extus dense hirsutum. *Alæ* oblongæ, carina breviores, 7–8 mm. longæ. *Carina* dorso angulo recto curvata, inde in rostrum rectum et gracilem attenuata, 9–10 mm. longa. *Legumen* sessile, oblongo-globosum, ± 4 mm. longum, dense pilosum, 1–2-spermum.

Nyasaland: Nyika Plateau, alt. 2000–3000 metres, *Whyte*! Hb. Kew.

53. C. Descampsii, *Micheli in Bull. Soc. Bot. Belg.* xxxvi. (1897) 53; *De Wild et Durand, Illustr. Fl. Congo*, 69. t. 35 (1899).

Suffrutex habitu *C. nyikensis*, Baker. *Caules* erecti, ad basin lignosi

copiose ramosi. *Stipulæ* minimæ. *Folia* trifolioliata, foliolis anguste lanceolatis mucronatis 6–8 mm. longis 2 mm. latis pubescentibus, petiolo communi 2–3 mm. longo suffulta. *Calycis tubus* brevis, lobis acutis parce setosopilosis tubum superantibus. *Vexillum* oblongum, obtusum, ± 10 mm. longum, subsessile, extus puberulum. *Alæ* angustæ. *Carina* apice longe rostrata, ± 10 mm. longa. *Ovarium* breve, biovulatum. *Legumen* ignotum.

CONGO REGION : Haut Marangu, *Descamps*, Hb. Brux.

This species is much more nearly allied to the preceding than to *C. Perrottetii*, DC., as stated in the original description.

54. C. LEPIDISSIMA, *Bak. fil.*, sp. nov.

Caulis suffruticosus, præcipue sursum cinereo-pubescens, *C. nyikensi*, Baker, valde affinis. *Stipulæ* inconspicuæ. *Folia* trifoliolata, foliolis strigoso-pubescentibus intermediis majoribus 20–25 mm. longis 7–10 mm. latis, lateralibus paullo minoribus inæquilateralibus, petiolo communi pubescente 4–7 mm. longo suffulta. *Flores* lutei, in capitula ad ramorum apices dispositi. *Capitula* globosa vel oblongo-globosa. *Calycis dentes* circ. 4 mm. longi, lineari-lanceolati. *Vexillum* luteum, 10–11 mm. longum, circ. 5 mm. latum, calyce longius. *Carina* dorso angulo recto curvata, inde in rostrum rectum sensim attenuata, in toto 10–11 mm. longa. *Legumen* globoso-conoideum, circ. 5 mm. longum, sessile, pilis albidis obtectum, 1–2-spermum, pedicellis fructiferis erecto-patentibus.

CONGO REGION : Nieuwdorp, *F. A. Rogers* No. 10404 ! Hb. Mus. Brit.

A close ally of *C. nyikensis*, Baker and *C. Descampsii*, Micheli.

The distinguishing features of this plant are :—

(*a*) The stems 30–40 cm. long.
(*b*) The oblong-elliptical, pubescent leaflets.
(*c*) The flowers in dense capitula at the ends of the branches.
(*d*) The carina bent at a right angle with a straight rostrum.
(*e*) The globose-conical, sessile pods 1–2-seeded.

Series 2. Flores in capitula subabsconditi et nonnunquam alii ex axillis foliorum supremorum. Calyx corolla longior vel subæquans. Carina dorso rotundata, 4–7 mm. longa. Suffrutices erecti, ramosi, foliis sessilibus vel subsessilibus.

55. C. ABSCONDITA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 19 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 198.

Suffrutex ramosus, valde foliosus, 3–6 dm. altus. *Rami* pilis dense obtecti. *Stipulæ* oculo nudo non conspicuæ. *Folia* trifoliolata, foliolis oblongis vel oblongo-lanceolatis 6–20 mm. longis 2–6 mm. latis, subtus pilosus. *Flores* aurantiaci, in capitula 2–20-flora dispositi. *Calyx* totus circ. 8 mm. longus,

laciniis lanceolatis. *Vexillum* unguiculatum, circ. 7 mm. longum. *Carina* dorso rotundata, 5–7 mm. longa. *Legumen* globosum, sessile, pisi magnitudine, pilis albis tectum, circ. 3–6-spermum.

ANGOLA: Huilla, *Welwitsch* No. 1927! Pungo Andongo, *Welwitsch* No. 1927 *b*! Hb. Mus. Brit.; near Don Affonso, *Gossweiler* No. 2901! Kassuango, *Gossweiler* 3740! near Munongue, *Gossweiler* No. 3094! Ganguellos, *Gossweiler* No. 4351! Hb. Mus. Brit.; Huilla, *Antunes* No. A. 62, Hb. Berol.

56. C. CISTOIDES, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 18 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 198.

Suffrutex gracilis, 3–6 dm. altus vel paulo altior, ramis rigidis erecto-patentibus. *Stipulæ* obsoletæ. *Folia* subsessilia, trifoliolata, foliolis oblanceolatis 10–15 mm. longis 2·5–4·5 mm. latis rigide coriaceis superne subglabris subtus sericeis. *Flores* lutei, in capitula pauciflora et in axillis foliorum supremorum dispositi. *Calyx* in toto 4·5 mm. longus, griseo-sericeus, dentibus lanceolatis tubo longioribus. *Carina* pallide lutea, calyce paulo brevior, dorso rotundata, 4–6 mm. longa. *Legumen* durum, globosum, circ. 4 mm. longum, adpresse griseo-sericeum, 2–4-spermum.

ANGOLA: Pungo Andongo, *Welwitsch* No. 1928! Kakonda, *Gossweiler* No. 4232! Hb. Mus. Brit.; Huilla, *Welwitsch* No. 1923! *Antunes & Dekindt* No. 3169! Hb. Mus. Paris.

A suffruticose herb with the habit of a *Cistus* branching in a broom-like manner.

Series 3. Flores in racemos densos dispositi et nonnunquam in axillis foliorum. Carina 7–12 mm. longa, calyce longior, apice in rostrum attenuata. Suffrutices virgati, sæpissime simplices et copiose foliosi.

57. C. STENOTHYRSUS, *Taubert in Engl. Bot. Jahrb.* xxiii. (1896) 178.

Caulis erectus, simplex, foliosus, indumento brevi tectus. *Stipulæ* oculo nudo non conspicuæ. *Folia* superne simplicia, inferne trifoliolata, foliolis lineari-oblanceolatis apice cuspidatis ad 22–35 mm. longis et 2·5–5 mm. latis supra glabris vel subglabris subtus ferrugineo-pilosis, petiolo communi 1–3 mm. longo suffulta. *Flores* mediocres, numerosi, in foliorum axillis solitarii vel in racemum dispositi. *Bracteolæ* lineares, apicem versus pedicelli positæ. *Calyx* uti pedicelli pubescens, dentibus e basi latiore subulatis. *Vexillum* elliptico-ovatum, 10–13 mm. longum, ungue brevi. *Carina* dorso angulo recto curvata, inde in rostrum sensim attenuata, in toto circ. 10–12 mm. longa. *Legumen* ignotum.

CONGO REGION: Chamsango on the Quango, *Mechow* No. 539! Hbb. Berol., Turic.

An erect leafy plant with oblanceolate, pubescent leaflets, and flowers in the axils of the leaves.

58. C. Seretii, *De Wild. Fl. Bangala et Ubangi*, 170 nomen (1911).

Caulis erectus, 55 cm. vel ultra altus, fulvo-tomentosus. *Folia* suprema simplicia, inferiora trifoliolata, foliolis oblanceolatis 20–30 mm. longis, pubescentibus, petiolo ± 15 mm. longo suffulta. *Flores* parviusculi, in racemos terminales multifloros dispositi. *Calyx* ± 4 mm. longus, pubescens, dentibus acutis. *Vexillum* ad apicem hirtum. *Carina* dorso angulo recto curvata, ± 8 mm. longa, apice rostrata. *Legumen* subglobosum vel oblongo-globosum, ± 7 mm. longum, fulvo-hirtum, sæpius 2-spermum.

Congo Region: Amadi, *Seret* No. 211 ! Hb. Brux.

Erect, fulvous-tomentose, with flowers in long terminal racemes, allied to *C. cuspidata*, Taubert.

59. C. Sapinii, *De Wild. Résultats Mission Compagnie de Kasai*, 307 (1910).

Caules erecti, numerosi, 25–30 cm. alti, ex radice crassa lignosa orti, brunneo-tomentosi. *Stipulæ* nullæ. *Folia* suprema simplicia, inferiora trifoliolata, foliolis oblanceolatis usque ad 17–22 mm. longis et 4–5 mm. latis, superne glabrescentibus subtus tomentosis, petiolo 4–7 mm. longo suffulta. *Flores* numerosi, in racemos terminales dispositi. *Bracteæ* 1–2 mm. longæ. *Pedicelli* 4–5 mm. longi. *Calyx* circ. 4 mm. longus, dentibus lanceolatis acutis tubo longioribus. *Vexillum* glabrum, ± 7 mm. longum, ± 4 mm. latum. *Carina* dorso rectangulari-curvata, 8–10 mm. longa, apice rostrata. *Legumen* subglobosum, pubescens, sessile, 1–2-spermum.

Ab *C. stenothyrso*, Taubert, differt caulibus humilioribus, floribus minoribus, etc.

Congo Region: Bondo, *A. Sapin* ! Hb. Brux.

60. C. benguellensis, *Bak. fil.*, sp. nov.

Caules plures ex eadem radice orti, virgati, cano-tomentosi. *Stipulæ* non conspicuæ. *Folia* trifoliolata, foliolis oblanceolatis oblongo-oblanceolatis vel anguste obovatis 10–17 mm. longis 4–6 mm. latis in sicco nigrescentibus subtus strigoso-pubescentibus, petiolo communi 3–7 mm. longo suffulta. *Flores* in racemos subdensos dispositi, non in axillis foliorum ut in *C. stenothyrso*, Taubert. *Racemi* 3–10 cm. longi, pluri- vel multiflori. *Bracteæ* angustæ. *Bracteolæ* parvæ. *Calyx* in toto 6–7 mm. longus; tubus oblique campanulatus, dentibus apice cuspidatis. *Vexillum* pallide flavum, 10–11 mm. longum. *Alæ* oblongæ, vexillo breviores. *Carina* dorso angulo recto curvata, inde in rostrum rectum sensim attenuata, circ. 10 mm. longa. *Ovarium* sessile. *Legumen* ignotum.

Benguella: *Gossweiler* No. 3635 ! Hb. Mus. Brit.

Rootstock cæspitose, stems numerous, erect, total height 35–40 cm. Calyx pale green, corolla pale bright yellow. Common in short shrub-grown pasturage at Kubal. Allied to *C. stenothyrsus*, Taubert, but the flowers are in a terminal raceme and the leaflets are shorter and broader.

61. C. CUSPIDATA, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 205 (1895).

Frutex ramis foliis inflorescentiis pilis aureo-ferrugineis adpressis strigoso-pubescens, ramis teretibus dense foliatis. *Stipulæ* minutæ, lineares, cuspidatæ. *Folia* trifoliolata, foliolis supra parce pubescentibus linearibus vel obovato-linearibus apice distincte cuspidatis basi cuneatis terminalibus lateralia 1·5–3-plo superantibus, petiolo 7–10 mm. longo suffulta. *Racemi* elongati, angustissimi, basi foliati, densiflori. *Bracteæ* setaceæ, pedicello paullo longiores. *Calyx* pilis ferrugineis strigoso-villosus, tubo pedicellum æquante. *Vexillum* calycem duplo superans, extus apice ferrugineo-pubescens. *Carina* 7–9 mm. longa. *Ovarium* aureo-hirsuto-villosum. *Legumen* brevissime stipitatum, ellipsoideo-globosum, pisi magnitudine, dense ferrugineo-pubescens, monospermum.

GERMAN EAST AFRICA: Undussuma, *Stuhlmann* No. 2834! Hb. Berol.

Series 4. Flores numerosi, in racemos multifloros plus minusve elongatos dispositi. Carina dorso angulo recto curvata, sæpius 8–10 mm. longa. Foliola oblonga vel oblongo-oblanceolata. Legumen pendulum vel erectum, 1–2-spermum. Herbæ.

62. C. NUTANS, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 24 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 199.

Herba 5–7 dm. alta. *Caulis* erectus, dichotome ramosus, pubescens. *Rami* herbacei. *Stipulæ* parvæ, setaceæ. *Folia* trifoliolata, foliolis oblongo-oblanceolatis vel oblongis 25–40 mm. longis usque ad 12 mm. latis membranaceis, petiolo communi pubescente 8–28 mm. longo suffulta. *Pedicelli* graciles, 1·5–2·0 mm. longi, fructiferi cernui. *Flores* lutei. *Bracteæ* circ. 2 mm. longæ. *Calyx* extus pubescens, 3–3·5 mm. longus. *Vexillum* in sicco flavum, carinæ fere æquilongum. *Alæ* oblongæ. *Carina* apice in rostrum rectum attenuata. *Legumen* nutans, pubescens, demum glabrum, subglobosum, 4–5 mm. longum.

ANGOLA: Huilla, *Welwitsch* No. 1907! Hb. Mus. Brit.; *Antunes* No. A 158! Hb. Berol.; Bumbo, *Bertha Fritzsche* No. 179! Hb. Berol. In flower 27 April, 1904.

RHODESIA: Near Mumbwa, *Mrs. Macaulay* No. 605! Hb. Kew.

HEREROLAND: Okahandja, *Dinter* No. 40! Hb. Kew; (forma floribus minoribus).

63. C. PROLONGATA, *Baker in Oliver, l. c.* ii. 25 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 200.

C. dubia, De Wild. Fl. Katanga, 185.

Caulis erectus, rufo vel ferrugineo-tomentosus, in specimine typico 30–40 cm. altus. *Stipulæ* setaceæ. *Folia* inter majora hujus gregis, trifoliolata,

foliolis cuneato-oblongis vel cuneato-obovatis 25–65 mm. longis 7–17 mm. latis, petiolo communi 35–40 mm. longo instructa. *Flores* in racemos multifloros dispositi. *Bracteæ* parvæ. *Calyx* hirsutus 3–4 mm. longus, laciniis tubo longioribus. *Vexillum* apice mucronatum, carina longius. *Carina* circ. 10 mm. longa. *Legumina* globosa vel oblongo-globosa, sessilia, rufo- vel ferrugineo-tomentosa.

ANGOLA: Pungo Andongo, *Welwitsch* No. 1955! Hb. Mus. Brit.

CONGO REGION: Katanga, *Verdick* No. 430! Hb. Brux.

Series 5. Flores in racemos subdensos dispositi cum nonnullis ex axillis foliorum. Carina 5–7 mm. longa, dorso angulo recto curvata, inde in rostrum attenuata. Legumina subglobosa, monosperma. Herba perennis, ramosa.

64. C. JOHNSTONII, *Baker in Kew Bull.* (1897) 250.

Herba perennis, erecta, ramosa, pube brevi induta. *Stipulæ* 0. *Folia* trifoliolata, foliolis facie subglabris dorso parce pilosis oblongo-oblanceolatis, intermediis 18–20 mm. longis 4–8 mm. latis, petiolo communi 5–7 mm. longo suffulta. *Pedicelli* fructiferi erecti. *Bracteæ* lineares, pedicello breviores. *Calyx* totus ±4 mm. longus, extus pilosus; lobi lanceolati, quam tubus longiores. *Vexillum* calyce longius, dorso pubescens. *Alæ* carinæ breviores. *Carina* 5–7 mm. longa. *Legumen* ±4 mm. longum, ±1-spermum, pilosum.

NYASALAND: Near Fort Hill, Nyasa-Tanganyika Plateau, alt. 1170–1330 metres, *Whyte*! Hb. Kew.

Series 6. Flores in racemos subdensos dispositi. Carina ±6 mm. longa. Legumen sessile, monospermum. Humilis, e basi ramosissima.

65. C. LEUCOTRICHA, *Baker in Kew Bull.* (1897) 251.

Herba perennis, 15–18 cm. alta, ubique albido- vel flavo-tomentosa. *Rami* tenues. *Stipulæ* nullæ vel cito deciduæ. *Folia* trifoliolata, foliolis oblanceolatis conspicue mucronatis 6–14 mm. longis 3–4 mm. latis utrinque dense persistenter pilosis, petiolo communi 4–8 mm. longo suffulta. *Corolla* pallide lutea, circ. 6 mm. longa. *Calyx* totus circ. 4 mm. longus, albido-pilosus, tubo brevi. *Vexillum* dorso pilosum. *Carina* curvata, apice in rostrum gracilem attenuata, 5–6 mm. longa. *Legumen* pilosum, globosum vel oblongum, circ. 3–4 mm. longum.

NYASALAND: Near Fort Hill, Nyasa-Tanganyika Plateau, alt. 1170–1330 metres, *Whyte*! Hb. Kew.

Series 7. Flores in racemos densos dispositi cum nonnullis ex axillis foliorum supremorum. Carina dorso angulo recto curvata, inde in rostrum rectum attenuata, in toto 6–8 mm. longa. Legumina globosa, sessilia. Herbæ.

66. C. HYSSOPIFOLIA, *Klotzsch in Peters's Mossamb. Bot.* i. 55 (1862); *Baker in Oliver, Fl. Trop. Afr.* ii. 24, non *Schinz in Plantæ Menyharthæ.*
C. gracillima, Klotzsch, l. c.

Herba erecta, ramosa, pubescens. *Stipulæ* oculo nudo non conspicuæ. *Folia* trifoliolata, petiolata, foliolis supra glabris subtus pubescentibus terminalibus circ. 12–18 mm. longis 4–5 mm. latis. *Calyx* pubescens; laciniis lanceolatis subæqualibus. *Vexillum* pubescens, carina brevius. *Carina* glabra, 6–8 mm. longa. *Legumen* apiculatum, circ. 3 mm. longum et latum, pubescens, dispermum.

ABYSSINIA: Sanka Beri, *Schimper* No. 1234! (1863–68) Hb. Mus. Brit.

BRITISH EAST AFRICA: Mau, *Scott Elliot* No. 6835! Hb. Mus. Brit.

PORTUGUESE EAST AFRICA: Querimba, *Peters*! Hb. Berol.

NYASALAND: Shire Highlands, *Adamson* No. 328!; Blantyre, *Buchanan*! Hb. Kew.

67. C. ERYTHROPHLEBA, *Welw. ex Baker in Oliver, l. c.* ii. 25 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 200.

Herba. Species pulchella, ramis virgatis argenteo-sericeis 20–35 cm. longis. *Stipulæ* oculo nudo non conspicuæ. *Folia* trifoliolata, foliolis argenteo-sericeis 5–10 mm. longis 1–2·5 mm. latis, petiolo communi 4–6 mm. longo prædita. *Flores* in racemos breves et in axillis foliorum supremorum dispositi. *Vexillum* lineis parallelis purpureis striatum, carina brevius. *Alæ* flavæ. *Carina* apice in rostrum rectum attenuata, in toto 7–8 mm. longa. *Legumen* globosum, sessile, pedicellis erectis.

ANGOLA: Huilla, *Welwitsch* No. 1983! Hb. Mus. Brit.

RHODESIA: Mumbwa, *Mrs. Macaulay* No. 736! Hb. Kew.

Series 8. Flores lutei, in racemos densos vel densiusculos dispositi. Carina 8–11 mm. longa, dorso angulo recto curvata, inde in rostrum attenuata. Legumina sessilia vel stipitata. Herbæ perennes vel suffrutices, 3–6 dm. alti.

68. C. QUANGENSIS, *Taubert in Engl. Jahrb.* xxiii. (1896) 177.

Herba perennis. *Caulis* erectus, sulcato-striatus, ferrugineo-villoso-pubescens. *Folia* breviter petiolata, foliolis supra glabris subtus pilosis, lineari-lanceolatis apice mucronulatis, lateralibus circ. 15 mm. longis, terminalibus 15–22 mm. longis. *Racemi* terminales, densiusculi. *Bracteæ* minutæ, setaceæ. *Calyx* 4–5 mm. longus, dentibus lanceolatis tubum excedentibus. *Corolla* calycem fere duplo superans. *Vexillum* circ. 9 mm.

attingens. *Carina* lutea, dorso angulata, apice in rostrum attenuata, in toto circ. 8–9 mm. longa. *Legumen* novellum subglobosum, ferrugineo-villoso-pubescens.

CONGO REGION: On the Quango, *Pogge* No. 155! Hb. Berol.

69. C. GLOBIFERA, *E. Mey. Com.* 24 (1835); *Harvey in Harvey & Sonder, Fl. Cap.* ii. 44.

C. macrostachya, Sonder in Linnæa, xxiii. (1850) 26.

C. Pentheri, Gandoger in Bull. Soc. Bot. Fr. lx. (1913) 459.

Suffrutex basi lignosus, multicaulis. *Caules* erecti, angulares, puberuli vel canescentes, usque ad 25–35 cm. alti. *Stipulæ* subulatæ vel obsoletæ. *Folia* foliolis cuneato-oblongis 10–23 mm. longis 4–10 mm. latis superne glabris subtus pubescentibus, petiolo communi 3–16 mm. longo suffulta. *Bracteæ* parvæ, ad basin pedicelli positæ. *Bracteolæ* lineares. *Calyx* pubescens, dentibus lanceolatis tubum æquantibus. *Carina* 9–11 mm. longa. *Legumen* stipitatum, oblique obovoideo-subglobosum, adpresse puberulum.

TRANSVAAL: Pretoria, *Rehmann* No. 4398! Hb. Schinz.

NATAL: Port Natal, *Krauss* Nos. 341! 440! Hb. Mus. Brit.; *Gueinzius* No. 1889! Hb. Kew.

PONDOLAND: Between the Omsamcaba and the Omsamwubo, *Drege*, Hb. Kew.

GRIQUALAND EAST: *Tyson*, Hb. Austr. Afr. No. 1252! Hb. Mus. Brit., and other collectors.

This species is fairly common in Natal, Transvaal, and East Griqualand.

Var. BRACHYCARPA, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 581.

Legumina valde oblique depresso-globosa.

TRANSVAAL: Macalisberg, *Burke*! Hb. Mus. Brit.; *Zeyher* No. 374! Hb. Mus. Brit.

Var. STENOPHYLLA, *Taubert in Engl. Jahrb.* xxiii. (1896) 178.

Foliola linearia, 1–1·5 mm. tantum lata.

CONGO REGION: Mukenge, *Pogge* No. 849! Hb. Berol.

70. C. MALANGENSIS, *Bak. fil.*, sp. nov.

Caules erecti, sulcati, circ. 40–50 cm. alti, ramosi, strigoso-puberuli. *Stipulæ* inconspicuæ vel obsoletæ. *Folia* trifoliolata, foliolis cuneato-obovatis vel oblongo-obovatis intermediis paullo majoribus 25–33 cm. longis 10–13 mm. latis apice apiculatis, petiolo superne canaliculato pubescente 15–24 mm. longo prædita. *Bracteæ* lineares, pedicellos subæquantes. *Flores* flavi, in racemos subdensos dispositi. *Racemi* iis *C. globifloræ*, E. Mey., subsimiles. *Pedicelli* ±4 mm. longi. *Bracteolæ* parvæ, lineares, ad apicem pedicellorum positæ. *Calyx* pubescens, in toto 4·5–5 mm. longus, dentibus

acutis. *Carina* 9–10 mm. longa, dorso angulo recto curvata, inde in rostrum rectum sensim attenuata. *Legumen* subglobosum, apiculatum, 6–7 mm. longum, sessile, pubescens, sæpius 1–2-spermum.

ANGOLA: Malange, *Gossweiler* No. 1326! Hbb. Kew., Mus. Brit.; *Mechow* No. 183! Hb. Berol.

Allied to *C. globifera*, E. Mey., but the pod is quite different and the leaflets are larger.

Series 9. Flores in racemos densiusculos dispositi. Carina circ. 10 mm. longa, apice in rostrum gracilem sensim attenuata. Foliola lineari-obovata. Legumina ellipsoideo-globosa, sessilia, plurisperma. Frutex vel suffrutex.

71. C. ADENOCARPOIDES, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 206 (1895).

Caulis erectus, gracilis, cinereo vel fulvo-tomentosus vel subvillosus, superne ramosus. *Stipulæ* inconspicuæ. *Folia* parviuscula, trifoliolata, foliolis lineari-obovatis vel oblongo-oblanceolatis 5–7 mm. longis 2·5–3·0 mm. latis, petiolo 3–4 mm. longo suffulta. *Calyx* circ. 5 mm. longus. *Legumen* ellipsoideo-globosum, pubescens, seminibus pluribus.

UGANDA: Ruchiga, *Bagshawe* No. 404! Hb. Mus. Brit.; Mt. Ruwenzori, 2000–2330 metr., *Scott Elliot* No. 7563! Hb. Mus. Brit.

GERMAN EAST AFRICA: West Mporo, Tschaworo, *Stuhlmann* No. 3148! Hb. Berol.

Somewhat similar in habit to a species of *Adenocarpus*. Noticeable on account of the rather dense clothing of the stem, the raceme of yellow and brown flowers, the slender rostrum of the carina, and the sessile elliptico-globose pods.

Series 10. Flores numerosi, in racemos elongatos dispositi. Carina dorso rotundata, ±10 mm. longa. Foliola obovata. Legumen pisiforme, pilis ferrugineis sericeum. Suffrutex.

72. C. FISCHERI, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 205 (1895).

Suffrutex videtur caulibus petiolis foliolorum pagina inferiore racemisque pilis ferrugineis villoso-pubescentibus. *Stipulæ* minutæ. *Folia* trifoliolata, foliolis obovato-oblongis obtusissimis apice mucronulatis basi cuneatis 20–30 mm. longis 10–15 mm. latis, petiolo communi 3–4 mm. longo suffulta. *Racemi* terminales, elongati, inferne foliati, densiflori. *Bracteæ* minutæ, oblongo-lanceolatæ, pedicellis apice bibracteolatis. *Vexillum* glabrum, calycem fere duplo superans. *Ovarium* stipitatum, villoso-pubescens. *Legumen* 2-spermum.

GERMAN EAST AFRICA: Merue, *Fischer* Nos. 164! 165! Hb. Berol.

Series 11. Flores parvi, in racemos laxiusculos vel densiusculos, nunc elongatos, nunc breves, dispositi. Carina parva, sæpius 5–7 mm. longa. Legumina globosa vel oblongo-globosa. Herbæ vel suffrutices.

73. C. SPHÆROCARPA, *Guill. & Perr. in DC. Prod.* ii. 133 (1825); *Fl. Seneg. Tent.* i. 167; *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 579; *Baker in Oliver, Fl. Trop. Afr.* ii. 23.

C. polycarpa, Benth. l. c. 580 (1843).

Herbacea, divaricata, ramosissima. *Caulis* basi glaber, sursum pubescens. *Stipulæ* minimæ. *Folia* trifoliolata, foliolis oblongo-ovatis 10–20 mm. longis 4–8 mm. latis fere glabris pallide viridibus, petiolo 5–12 mm. longo suffulta. *Flores* flavescentes, in racemos longos et laxos dispositi. *Pedicelli* graciles. *Bracteæ* ad basin pedicelli angustæ, ±1·5 mm. longæ. *Calyx* glaber, totus circ. 3 mm. longus; laciniæ circ. 2 mm. longæ. *Alæ* oblongæ, carina breviores. *Carina* dorso rectangulari-curvata, inde in rostrum rectum attenuata, 5·5–6 mm. longa. *Legumen* sessile, oblongo-globosum, sæpissime glabrum, 2–4-spermum.

SENEGAMBIA: *Perrottet* No. 171! Hb. Mus. Brit., Hb. Paris, *Roger*! Hb. Kew., *Heudelot* No. 483! Hb. Kew. (type of *C. polycarpa*, Benth.).

SIERRA LEONE: *Afzelius*! Hb. Mus. Brit.

DJURLAND: *Schweinfurth* No. 2604! Hb. Kew.

UGANDA: *R. Fyffe* No. 74! Hb. Kew.

SOUTH CENTRAL AFRICA: In the interior near the Tropic, *Chapman & Baines*! Hb. Kew.

A plant collected in Kordofan is intermediate between the type and var. *angustifolia*, Hochst.

Var. ANGUSTIFOLIA, *Hochst. in Unio Inter Nub.* No. 282.

C. nubica, Benth. in Hook. Lond. Journ. Bot. ii. (1843) 581; Harvey in Harvey & Sonder, Fl. Cap. ii. 45.

Herbacea, ramosa, piloso-pubescens. *Stipulæ* parvæ, lineari-lanceolatæ. *Folia* trifoliolata, foliolis linearibus vel oblongo-linearibus 25–35 mm. longis 3–4 mm. latis supra glabris subtus adpresse pubescentibus, petiolo communi 12–15 mm. longo prædita. *Racemi* multiflori, 8–15 cm. longi. *Bracteæ* sub pedicello positæ, circ. 1 mm. longæ. *Calyx* totus circ. 3 mm. longus, pubescens; laciniæ tubo longiores. *Vexillum* apice mucronatum, carinam subæquans. *Alæ* oblongæ. *Carina* dorso rectangulari-curvata, inde in rostrum rectum attenuata, circ. 6 mm. longa. *Ovarium* 4–6-ovulatum. *Legumen* sessile, obovoideum, circ. 6 mm. longum, pubescens, sæpius 2-spermum.

SENEGAMBIA: Mbidjem, *Thierry*! Hb. Kew.

SIERRA LEONE: Between Ruka and Kitchom, *Scott Elliot* No. 4310! Hb. Kew.

SUDAN: Kordofan, *Kotschy* No. 282! Hb. Mus. Brit.; *Dr. Pfund* Nos. 128! and 161! Hb. Kew.

MITTULAND: *Schweinfurth* No. 2827! Hb. Schweinf. (forma foliolis brevioribus).

RHODESIA: Livingston, *F. A. Rogers* No. 7197! Hb. Mus. Brit. Zambesi, *Dr. Holub*! Hb. Kew.

PORTUGUESE EAST AFRICA: Delagoa Bay, *Forbes*! Hb. Mus. Paris; *L. Scott,* Hb. Kew.; Lourenço Marques, *Schlechter* No. 11665! Hb. Turic. (forma).

TRANSVAAL: Boshveld, *Rehmann* Nos. 5035! and 5178! Hb. Turic.

GRIQUALAND WEST: Kimberley, *Rehmann* No. 3457! Hb. Turic.

AMBOLAND: *Schinz*! Hb. Schinz.

GREAT NAMAQUALAND: Daberas, *Fleck* No. 447! Hb. Schinz.

Var. GRANDIFLORA, *Schweinfurth in Herb. Berol.*

Foliola suprema lineari-oblanceolata. *Flores* majores. *Carina* 7–8 mm. longa.

DJURLAND: *Schweinfurth,* Ser. II. No. 64! Hb. Berol.

Var. LANCEOLATA, *Schinz in Abh. Bot. Ver. Brand.* xxx. (1888) 160.

Annua, erecta, e basi ramosa, ubique pilis patentibus et brevibus induta, circ. 40 cm. alta. *Stipulæ* lineari-lanceolatæ vel lanceolatæ. *Folia* trifoliolata, foliolis lanceolatis vel oblongo-ellipticis 15–60 mm. longis 6–10 mm. latis, petiolo communi 15–25 mm. longo suffulta. *Racemi* 5–15 mm. longi, sæpius 15–40-flori. *Calycis* tubus ±1 mm. longus; laciniæ lanceolatæ, 2 mm. longæ. *Vexillum* extus hirsutum, 5.5 mm. longum, ±3 mm. latum, apice mucronatum. *Carina* dorso rectangulari-curvata, inde in rostrum rectum attenuata, circ. 6 mm. longa. *Legumen* globosum, pendulum, sessile, hirtum.

AMBOLAND: Oshiheke, *Schinz* No. 533! Omsamukene, *Rautanen* No. 312! Hb. Turic. This variety is intermediate between *C. sphærocarpa,* Guill. & Perr., and *C. nutans,* Welw.

The rostrum of the carina is slender and straight, and the pod sessile, globose, and pendulous. A plant collected by *Menyharth* at Boruma, No. 57, is closely allied.

74. C. CARSONII, *Bak. fil.*, sp. nov.

Annua, erecta, simplex vel ramosa, 25–45 cm. alta. *Radix* exilis. *Rami* virgati, filiformes. *Stipulæ* non conspicuæ. *Folia* trifoliolata, foliolis linearibus vel lineari-oblanceolatis apice mucronatis 4–6 mm. longis 1–1·5 mm. latis pubescentibus, petiolo communi 2–3 mm. longo suffulta. *Flores* parvi, in racemos laxos dispositi. *Pedicelli* graciles, erecti vel suberecti, non cernui, 2–3 mm. longi. *Bracteæ* circ. 1 mm. longæ. *Calycis* tubus 3 mm. longus. *Bracteæ* circ. 1 mm. longæ. *Vexillum* circ. 6 mm. longum, dorso pubescens.

Alæ carina breviores. *Carina* dorso angulo recto curvata, inde in rostrum sensim attenuata, 5–6 mm. longa. *Legumen* globosum, sessile, 3–4 mm. longum, sæpius monospermum, pedicellis fructiferis suberectis.

NYASALAND: Niamkolo, *A. Carson*! Hb. Kew. In flower and fruit May 1889.

Allied to *C. filicaulis*, Welw., but the vexillum is not so densely tomentose and the carina of a different shape. Branches slender, virgate.

75. C. GRAMINICOLA, *Taubert, MS. in Herb. Berol.*

Radix lignosa. *Suffrutex* 10–40 cm. altus. *Caules* numerosi, ex eadem radice orti. *Stipulæ* parvæ, oculo nudo vix conspicuæ. *Folia* trifoliolata, foliolis griseo-viridibus cuneato-oblanceolatis 8–18 mm. longis 4–7 mm. latis subtus strigoso pubescentibus, petiolo communi 3–8 mm. longo suffulta. *Flores* parvi, erecti vel suberecti, in racemos laxiusculos terminales vel axillares dispositi. *Bracteæ* lineares, 2–3 mm. longæ. *Bracteolæ* lineares, ad basin calycis positæ, circ. 1·5 mm. longæ; pedicelli floriferi 1·5–2 mm. longi, fructiferi longiores. *Calyx* totus circ. 4 mm. longus, extus pubescens, dentibus acutis. *Vexillum* aureo-luteum, lineis rubris notatum, suborbiculari-obovatum, circ. 6 mm. longum. *Alæ* luteæ, oblongæ, carina breviores. *Carina* apice in rostrum attenuata, circ. 6–7 mm. longum. *Legumen* globosum vel subglobosum, apiculatum, ±4 mm. longum, pubescens, circ. 2-spermum, erectum, sessile.

SENEGAMBIA: *Heudelot* No. 614! Hb. Kew., etc.

N. NIGERIA: Katagum District, *Dalziel* No. 377! Hb. Kew.

CAMEROONS: Hinterland, *Passarge* No. 107! Ngaundere, *Passarge* No. 171! Sokode, *Kersting* No. 128! Berim, *Ledermann* Nos. 2492! 2496! Pass Tchape, *Ledermann* No. 2815! Hb. Berol.

The distinguishing characteristics of this slender suffrutex are the oblanceolate leaflets, the numerous, small, erect or suberect flowers, which are golden yellow with red stripes and arranged in lax many-flowered racemes, the carina 6–7 mm. long, and the globose or subglobose pods which are not pendulous.

76. C. FILICAULIS, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 24 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 199.

Annua. *Caulis* erectus, usque ad 40 cm. altus, virgatus, gracilis, simplex vel ramosus, strigoso-pubescens. *Stipulæ* oculo nudo non conspicuæ. *Folia* trifoliolata, foliolis linearibus, 8–12 mm. longis 1–2 mm. latis strigoso-pubescentibus, petiolo communi 2–3·5 mm. longo suffulta. *Flores* lutescentes, erecti, in racemos laxos pluri vel multifloros dispositi. *Bracteæ* ad basin pedicelli positæ, 1–2 mm. longæ. *Calyx* ±3·5 mm. longus. *Vexillum* extus sericeo-tomentosum, circ. 6 mm. longum. *Carina* naviculariformis, apice acuta, 5–5·5 mm. longa. *Legumen* erectum, subglobosum, sessile, 2·5–3·0 mm. diam., pubescens.

ANGOLA: Huilla, *Welwitsch* No. 1982! Hb. Mus. Brit.; *Antunes & Dekindt* No. 3165! Hb. Mus. Paris; Benguella, Bailundo District, *Dr. Wellman*! Hb. Kew.

The slender stem and filiform branches, the very narrow leaflets, and the lax racemes distinguish this species.

A specimen from Kundelungu, in the Congo Region, *Kässner* No. 2782, is probably a form of this species.

77. C. LUKOMÆ, *Bak. fil.*, sp. nov.

Caulis erectus, virgatus, strigoso-pubescens. *Stipulæ* non conspicuæ. *Folia* trifoliolata, foliolis strigoso-pubescentibus viridibus oblanceolatis vel cuneato-oblongis apice mucronatis lateralibus 5–15 mm. longis, intermediis 10–18 mm. longis 2·5–3·0 mm. latis, petiolo communi pubescente 3–5 mm. longo suffulta. *Flores* parviusculi, axillares et in racemos laxos dispositi. *Bracteæ* ad basin pedicelli parvæ, lineares; pedicelli graciles 2–4 mm. longi. *Calyx* totus 3–3·5 mm. longus, pubescens, dentibus acuminatis tubo longioribus. *Vexillum* extus pubescens, circ. 5 mm. longum. *Alæ* oblongæ, unguiculatæ. *Carina* dorso angulo recto curvata, subcymbiformis, apicem versus in rostrum sensim attenuata, circ. 5 mm. longa. *Legumen* globosum, sessile, pubescens, sæpe monospermum, pedicellis fructiferis erectis vel suberectis non nutantibus.

CONGO REGION: River Lukoma, *Kässner* No. 2699! Hb. Mus. Brit., Turic. In flower 5 May, 1908; Mugila Mts., open plain, *Kässner* No. 2999 *a*! Hb. Mus. Brit.

A virgate plant with the flowers axillary and in lax racemes. Carina about 5 mm. long. Pod globose, sessile, erect.

78. C. SQUARROSA, *Schinz in Mém. Herb. Boiss.* i. (1900) 130.

Herba vel suffrutex squarrosus, hirtus. *Stipulæ* lanceolatæ. *Folia* trifoliolata, foliolis obovatis oblongo-obovatis vel oblongis 10–22 mm. longis 5–10 mm. latis, petiolo communi 6–13 mm. longo suffulta. *Flores* parviusculi, in racemos laxos et laterales et terminales pluri- vel multifloros dispositi. *Calyx* totus circ. 2–3 mm. longus; laciniæ acutæ, hirsutæ. *Vexillum* luteum, apice mucronatum. *Carina* hirsuta, circ. 5 mm. longo, dorso rectangulari-curvata, inde in rostrum sensim attenuata. *Legumen* obovoideum vel oblongo-globosum, 5–6 mm. longum, pubescens, subsessile, sæpe 2-spermum.

AMBOLAND: Olukonda Oshiheke-formation, *Rautanen* Nos. 226! 457! Ulukuanjama, *Tönjes*! Hb. Turic.

A specimen from Lourenço Marques collected by *Schlechter* No. 11,665, and named *C. nubica*, Benth., is closely allied.

Var. nov. DINTERI, *Bak. fil.*

Erectus ramosus, circ. 75 cm. altus. *Foliola* linearia vel lineari-lanceolata,

15–35 mm. longa, 2–5 mm. lata, petiolo communi 15–20 mm. longo. *Flores* in racemos laxos multifloros 6–25 cm. longos dispositi. *Carina* circ. 5 mm. longa. *Legumina* oblongo-globosa, circ. 5 mm. longa, extus pubescentia.

HEREROLAND : Okahandja, *Dinter* No. 40 ! Hb. Turic.

TRANSVAAL : *R. Schlechter* No. 4263 ! Hb. Turic.

The racemes in the type are 4–12 cm. long, and in var. *Dinteri* 6–25 cm.

Series 12. Flores paniculatim dispositi. Carina 9–14 mm. longa, dorso angulo recto curvata, inde in rostrum rectum attenuata. Herbæ vel suffrutices, erecti, sæpius elati.

79. C. FLORIDA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 30 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 202.

Caules plures ex eadem radice orti, 3–10 dm. alti, erecti, angulati, ramosi. *Stipulæ* 0. *Folia* trifoliolata, foliolis oblanceolatis oblongo-oblanceolatis vel cuneato-obovatis 5–15 mm. longis 2–4 mm. latis, petiolo communi 2–8 mm. longa suffulta. *Flores* lutei. *Bracteæ* parvæ, angustæ. *Bracteolæ* parvæ. *Calyx* totus ±4 mm. longus, dentibus acutis. *Vexillum* suborbiculari-obovatum, cum ungue circ. 10 mm. longum. *Alæ* luteæ, circ. 10 mm. longæ. *Carina* lutea, ±10 mm. longa. *Legumen* subglobosum, sessile, subacutum, 1-spermum.

CONGO REGION : Kipaila, *Kässner* No. 2527 ! Hb. Mus. Brit. ; East Senga, *Kässner* No. 2933 ! Hbb. Mus. Brit., Turic.

ANGOLA : Huilla, *Welwitsch* No. 1925 ! Hb. Mus. Brit. ; near Kakonda, *Gossweiler* No. 3844 ! between the Kului and the Kubangue, *Gossweiler* No. 3366 ! Hb. Mus. Brit.

RHODESIA : Lukanda Valley, *C. E. F. Allen* No. 474 ! Hb. Kew. ; N.W. Rhodesia, *Kässner* No. 2096 ! Hb. Turic.

80. C. ACUMINATISSIMA, *Bak. fil.*, sp. nov.

Radix napiformis. *Caules* plures ex eadem radice orti, deorsum teretes, sursum leviter striati. *Folia* trifoliolata, foliolis oblongis vel oblongo-obovatis basi cuneatis apice mucronatis 8–10 mm. longis 2–4 mm. latis, petiolo communi 3–8 mm. longo suffulta. *Flores* mediocres, in paniculam multifloram dispositi. *Calyx* hirsutus, in toto circ. 4 mm. longus, dentibus acutis. *Vexillum* carina sæpius brevius. *Carina* 9–10 mm. longa, dorso angulo recto curvata, inde in rostrum rectum acuminatissimum sensim attenuata. *Legumen* globosum, calyce longius, ±5 mm. longum, sessile vel subsessile, pilis albidis obtectum, sæpius monospermum.

ANGOLA : In open Mumia woods in the valley of Tiengo-Kuito, *Gossweiler* No. 3750 ! Hb. Mus. Brit.

An annual shrub-like herb with a usually swollen napiform root, leaves glaucous green, and yellow flowers.—J. Gossweiler.

Easily recognised from its near allies by the stem being terete towards the base, the very numerous paniculate flowers, the keel bent at a right angle, and the globose, monospermous, sessile pods with an erect, or suberect, fruiting pedicel.

81. C. POLYANTHA, *Taubert in Engl. Jahrb.* xxiii. (1896) 179.

Rami ramulique atro-ferrugineo-tomentelli. *Folia* trifoliolata, foliolis lineari-obovatis basi cuneatis, 12–20 mm. longis 6–8 mm. latis, supra granuloso-punctatis, petiolo communi 3–5 mm. longo suffulta. *Flores* numerosi, pedicellati, pedicellis calycibusque pilis aureo-ferrugineis indutis. *Bracteolæ* 2, ad apicem pedicelli insertæ, circ. 1·5 mm. longæ. *Calycis tubus* 2·5 mm. longus, dentes 3 mm. longi. *Vexillum* calycem plus quam duplo superans, 12–13 mm. longum. *Carina* 12–14 mm. longa. *Legumen* ignotum.

CONGO REGION : Mukenge, *Pogge* Nos. 845 and 846 ! Hb. Berol.

The position of this species is uncertain in the absence of the pod.

82. C. KUNDELUNGUENSIS, *Bak. fil.*, sp. nov.

Caulis erectus, ramosus, pubescens, elatus. *Stipulæ* non conspicuæ. *Folia* suprema simplicia, inferiora trifoliolata, foliolis supremis lineari-oblongis, inferioribus obovatis vel oblongo-obovatis, viridibus 15–50 mm. longis 15–20 mm. latis, petiolo communi 20–25 mm. longo suffulta. *Flores* mediocres in paniculam racemiformem dispositi. *Bracteæ* lineares. *Bracteolæ* angustæ. *Pedicelli* graciles, bracteis longiores. *Calyx* circ. 6 mm. longus, dentibus lanceolatis acuminatis. *Vexillum* luteum, carina paullo longius, circ. 11 mm. longum. *Alæ* oblongæ, vexillo breviores. *Carina* dorso angulata, inde in rostrum rectum gracilem attenuata, in toto 10–11 mm. longa, calyce fere duplo longior. *Legumen* oblongo-globosum, obliquum, sessile, 6–8 mm. longum, pubescens.

CONGO REGION : Mt. Kundelungu, *Kässner* No. 2743 ! Hbb. Mus. Brit., Turic. In flower and fruit 14 May 1908. Flowers in a lax racemose panicle, carina yellow with a long rostrum, pod oblong-globose.

Series 13. Flores in racemos subdensos dispositi cum nonnullis ex axillis foliorum supremorum Carina dorso angulo recto curvata, in toto 7–8 mm. longa. Legumina globosa vel oblongo-globosa, plurisperma. Annua, erecta.

83. C. ANTUNESII, *Bak. fil.*, sp. nov.

Annua, ramosa vel simplex, 0·4–0·8 met. alta, plus minusve cinereo-pubescens vel subtomentosa. *Stipulæ* oculo nudo non conspicuæ. *Folia* trifoliolata, foliolis cuneato-oblanceolatis vel cuneato-obovatis apice mucronatis

4–8 mm. longis 2–3 mm. latis strigoso-pubescentibus, costa subtus conspicua, petiolo communi 4–6 mm. longo suffulta. *Flores* sec. cl. detectores flavi, in sicco rubri. *Bracteæ* ad basin pedicelli parvæ, angustæ. *Pedicelli* 2–3 mm. longi. *Calyx* totus ±5 mm. longus, dentibus lanceolatis tubo longioribus. *Vexillum* calyce longius. *Carina* dorso angulo recto curvata, hinc in rostrum gracilem subito attenuata, in toto 7–8 mm. longa. *Legumen* globosum vel oblongo-globosum, sessile, circ. 5 mm. diam. et 6–7 mm. longum, pubescens, 7–10-spermum, pedicellis erectis.

ANGOLA: Huilla, *Antunes & Dekindt* No. 3246! Hb. Mus. Paris. Alt. 1790 m. In flower Feb. 1903.

The characteristic features of this plant are the erect cinereo-pubescent or cinereo-tomentose stem, the cuneate-oblanceolate or cuneate-oblong leaflets, the flowers, either gathered in racemes or seated in the axils of the leaves, the very slender rostrum of the keel, and the several-seeded, oblong, globose, erect pods.

Allied in some respects to *C. dura*, Wood & Evans, but the carina is different.

Series 14. Flores in racemos laxos dispositi. Carina dorso rotundata, 5–8 mm. longa. Legumina subglobosa, oblique oblonga vel late ellipsoidea, 2–6-sperma. Fruticuli vel suffrutices.

84. C. HUILLENSIS, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 205 (1895), nomen in obs.

C. ramosissima, Baker, ex Oliver, Fl. Trop. Afr. ii. 26 (1871); Hiern, Cat. Welw. Afr. Pl. i. 200, *non* Roxb.

Radix lignosa. *Caulis* ramosissimus, pubescens. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis oblongo-obovatis vel elliptico-obovatis 6–20 mm. longis 4–10 mm. latis, petiolo communi 5–9 mm. longo prædita. *Flores* parviusculi, in racemos 6–12-floros dispositi. *Bracteæ* 1·5–2 mm. longæ. *Calyx* totus ±4 mm. longus, pubescens. *Vexillum* circ. 5·5 mm. longum, 4 mm. latum. *Alæ* carina breviores. *Carina* uncinata, 7–8 mm. longa. *Legumen* subglobosum, brevissime stipitatum, cum stipite 9–10 mm. longum, hirtum, 5–6-spermum.

ANGOLA: Huilla, *Welwitsch* No. 1973! Hb. Mus. Brit., etc.

85. C. DURA, *Wood & Evans in Journ. Bot.* xxxv. (1897) 487.

C. globifera, E. Meyer, var. *glabra*, Harvey, in Harvey & Sonder, Fl. Cap. ii. 44.

Caules virgati, superne ramosi. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis variantibus ex oblanceolato ad lineari-oblongum mucronulatis, terminalibus 14–18 mm. longis, lateralibus 12–14 mm. longis, minute punctatis subtus pubescentibus, petiolo communi 3–12 mm. longo prædita. *Flores*

lutei, in racemos laxe plurifloros dispositi. *Bracteæ* lineares. *Calycis* tubus turbinatus, 2–3 mm. longus, lobis subulatis. *Vexillum* suborbiculatum. *Alæ* anguste oblongæ. *Carina* 7–8 mm. longa. *Legumen* oblique oblongum vel elliptico-oblongum, villosum, circ. 4-spermum.

PORTUGUESE EAST AFRICA : Delagoa Bay, *H. Junod* No. 153 ! Hb. Turic. (sub nom. *C. globifera*, E. Mey., var. *glabra*, Harvey), *R. Schlechter* No. 11994 ! Hb. Turic.

NATAL : Nowdsberg, *Wood* No. 385 ! *Wood* Nos. 4134 ! & 5278 ! Hb. Kew.; Stony Hill near Bothas, *Wood* No. 947 ! Inanda, *Wood* ; Zululand, *Gerrard* No. 1722 ! Hb. Mus. Brit. ; Natal, *Dr. Sutherland* ! Hb. Kew.

86. C. DUMOSA, *Franchet in Revoil Çomalis*, 25 (1882).

C. Jamesii, Oliver, Icones. t. 1530 (1886) ; F. L. James, Unknown Horn of Afr., Append. 319, t. 5.

Fruticulus plus minusve adpresse sericeus, intricato-ramosus, 8–20 cm. altus, ramis demum subspinescentibus. *Stipulæ* breves, herbaceæ, lineari-subulatæ vel ovato-lanceolatæ. *Folia* trifoliolata, foliolis obovatis vel oblanceolatis obtusis apiculatis 3–8–12 mm. longis, petiolo 3–4 mm. longo suffulta. *Flores* parviusculi, in racemos laxos dispositi. *Bracteæ* parvæ, angustæ. *Bracteolæ* angustæ. *Calyx* totus 3·5–4 mm. longus, dentibus acutis. *Corolla* lutea, parvula. *Vexillum* striatum, carinæ subæquilongum. *Alæ* oblongæ. *Carina* dorso rotundata, apice in rostrum attenuata, 5–6 mm. longa. *Legumen* 2–3-spermum, pedicello recurvo.

SOMALILAND : *Revoil* ! Hb. Mus. Paris ; Hahi and Adda Gallah, *James & Thrupp* ! Hb. Kew. ; Golis Range, *Drake-Brockman* ! Hb. Kew. ; Upper Sheik, *Major Thomson* No. 32 ! Hb. Kew. ; Somaliland, *Lort Phillips* ! Hb. Kew. ; Abdallah, *Keller* ! Hb. Turic.

Series 15. Flores parviusculi, in racemos numerosos laxos axillares et terminales dispositi. Carina dorso angulo recto curvata, inde in rostrum gracile attenuata, 6–9 mm. longa. Legumina globosa. Annuæ, erectæ, ramosæ, ramis patulis.

87. C. LAXIFLORA, *Baker in Kew Bull.* (1895) 64.

Annua, ramosissima, glabra, ad *C. tenuiramam*, Welw., accedens. *Rami* virgati, tenues, patentes vel erecto-patentes. *Stipulæ* non conspicuæ. *Folia* trifoliolata, foliolis angustis glauco-viridibus lineari-oblanceolatis, petiolo communi 4–6 mm. longo prædita. *Bracteæ* lineares, minutæ. *Pedicelli* graciles. *Calyx* totus 5–6 mm. longus ; lobi lanceolati, tubo longiores. *Vexillum* carinam paullo superans. *Carina* 8–9 mm. longa. *Legumen* globosum, circ. 6 mm. longum, sessile, monospermum, pedicellis gracilibus erectis vel suberectis.

NYASALAND: Fwambo, *Carson* No. 28! (1894) Hb. Kew.

The lax raceme, narrow, glaucous-green leaflets, and the slender pedicels make this plant easy of recognition.

88. C. TENUIRAMA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. (1871); 24 *Hiern, Cat. Welw. Afr. Pl.* i. 199.

Annua, erecta, 3–10 dm. alta. *Rami* numerosi, erecto-patentes, virgati. *Stipulæ* 0. *Folia* trifoliolata, foliolis oblanceolatis superne pallide viridibus subtus glaucis tenuiter griseo-sericeis, petiolo communi 3–5 mm. longo prædita. *Bracteæ* sub pedicello parvæ. *Calyx* totus 3 mm. longus. *Vexillum* lineis striatum, circ. 6 mm. longum. *Alæ* vexillo breviores. *Carina* 6–7 mm. longa. *Legumen* parviusculum, sessile, subrotundum, erectum, 1–2-spermum.

CONGO REGION: Elisabethville, *J. Bequaert* No. 343! Hb. Brux.; Haut Uele, *Nys*! Hb. Brux.

ANGOLA: Pungo Andongo, *Welwitsch* No. 1980! Huilla, *Welwitsch* No. 1981! Hb. Mus. Brit., etc.

Series 16. Flores in racemos laxissimos plus minusve elongatos dispositi. Carina 8–9 mm. longa, dorso angulo recto curvata, inde in rostrum rectum attenuata. Herbæ erectæ.

89. C. CERNUA, *Schinz in Mém. Herb. Boiss.* i. (1900) 127.

Erecta, annua, herbacea, ramosa, adpresse pilosa. *Stipulæ* subulato-lanceolatæ, parvæ. *Folia* trifoliolata, foliolis anguste lanceolatis vel ellipticis 4–6 cm. longis circ. 5 mm. latis supra glabris et punctulatis subtus sparse pilosis, petiolo communi 15–30 mm. longo prædita. *Flores* aurei, in racemos terminales et laterales laxissime plurifloros dispositi. *Pedicelli* ±5 mm. longi, fructiferi cernui. *Calycis segmenta* lanceolata, acuta, sparse sericea, tubo longiore. *Vexillum* 9 mm. longum, sericeum, luteum. *Carina* 8–9 mm. longa, cymbæformis. *Legumen* globosum, cernuum, 4–5 mm. longum, pubescens vel sericeum, bispermum.

ANGOLA: Humbe on the Kunene, *H. Baum* No. 100! Hb. Berol., Mus. Brit., etc.

AMBOLAND: Olukonda, *Rautanen* Nos. 224! 226! 272! Hb. Turic.; Uukuanjama, *Tönjes*! Hb. Turic.

HEREROLAND: *Dinter* No. 536! Hb. Turic.

The racemes are long and lax, the leaflets linear or narrow lanceolate, and the pods glabrous.

Forma LATIFOLIA, *Schinz in Hb. Turic.*

Foliola latiora, oblonga vel oblongo-elliptica.

AMBOLAND: Ondonga, *Rautanen* No. 375! Hb. Turic.

90. C. TRUNCATA, *Schinz in Mém. Herb. Boiss.* i. (1900) 130.

Herba erecta. *Rami* adpresse pilosi. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis lanceolatis late ellipticis vel spatulatis truncatis mucronatis 30–40 mm. longis 10–12 mm. latis superne glabris subtus sparse pilosis, petiolo communi 27–35 mm. longo suffulta. *Flores* flavi, rubro-striati, in racemos terminales et laterales laxissime plurifloros dispositi. *Calyx* 4–4·5 mm. longus ; laciniæ acutæ, pilosæ. *Alæ* carina breviores. *Vexillum* carinæ subæquilongum, striatum. *Carina* dorso angulo recto curvata, inde in rostrum rectum sensim attenuata, in toto 9–10 mm. longa. *Legumen* obovoideum, ±4 mm. longum.

AMBOLAND : Olukonda, *Schinz* No. 2075 ! Hbb. Schinz, Kew.

This is an erect, branched herb with trifoliolate leaves, and oblong or elliptical, truncate leaflets, the raceme is very lax, the carina 9–10 mm. long, the pod oblong-ovoid.

Series 17. Flores parviusculi, in racemos laxos dispositi. Carina ±8 mm. longa. Herba vel suffrutex humilis.

91. C. BORANICA, *Harms in Hb. Berol.*

Caules plures, adscendentes vel suberecti, 15–20 cm. longi. *Stipulæ* angustæ. *Folia* foliolis lineari-lanceolatis intermediis 3·5 cm. longis 5–6 mm. latis, petiolo communi circ. 6 mm. longo instructa. *Racemi* laxi, breves. *Carina* dorso rotundata, rostro longo instructa, circ. 8 mm. longa. *Legumina* globosa vel elliptico-globosa, 7–8 mm. longa.

GALLA HIGHLANDS : Boran, *Ellenbeck* No. 2158 ! Hb. Berol.

A dwarf plant branching just above the root. Stems several, ascending or suberect. Raceme short, lax, few-flowered. Flowers rather small, pedicels patent.

Series 18. Flores mediocres, pauci apicem versus pedicellati. Carina dorso angulo recto curvata, inde in rostrum gracile sensim attenuata, in toto 6–8 mm. longa. Legumen sessile, globosum vel subglobosum. Annua, gracilis, pusilla.

92. C. CONGOENSIS, *Bak. fil.*, sp. nov.

Annua, humilis, 4–6 cm. tantum alta. *Caules* plures, filiformes, adscendentes vel suberecti, pubescentes. *Folia* trifoliolata, foliolis cuneato-obovatis 4–6 mm. longis 2–3 mm. latis præcipue subtus pilis tectis, petiolo communi 2–4 mm. longo instructa. *Flores* pauci, sæpius 2–3, pedicellis gracilibus fusco-hirsutis. *Bracteæ* parvæ. *Calyx* pilis obtectus, in toto 3·5–4·0 mm. longus, tubo brevi, laciniis lanceolatis tubo longioribus. *Vexillum* calyce longius. *Carina* lutea, 6–8 mm. longa. *Legumen* 6–7 mm. longum, pubescens.

CONGO REGION : Mt. Kundelungu under trees, *Kässner* No. 2720 ! Hb. Turic. In flower and fruit 7. May, 1908.

A small, dwarf annual, with few flowers and filiform stems, almost the smallest plant among the Sphærocarpæ.

Series 19. Flores in axillis foliorum, et nunnunquam in racemos terminales dispositi. Carina 4–13 mm. longa. Annuæ vel perennes, foliolis oblanceolatis vel cuneato-oblongis.

93. C. BEQUAERTII, *Bak. fil.*, sp. nov.

Annua, e basi copiose ramosa, ramis erectis vel erecto-patulis strigoso-pubescentibus, circ. 30 cm. alta. *Folia* trifoliolata, foliolis intermediis oblanceolatis 10–14 mm. longis 2–3 mm. latis lateralibus inæquilateralibus paullo minoribus, petiolo communi pubescente 5–10 mm. longo suffulta. *Flores* parviusculi, pedicellati, pedicellis hirsutis. *Calyx* extus hirsutus, dentibus lanceolatis. *Carinæ* rostrum rectum, gracile. *Carina* in toto circ. 5 mm. longa. *Legumen* globosum, sessile, pilis obtectum, sæpe 2-spermum, pedicellis erectis.

CONGO REGION : Elisabethville, *J. Bequaert* No. 342 ! Hb. Brux.

This is a copiously branching annual, with flowers in the axils of the leaves. The leaves are trifoliolate, the middle leaflet oblanceolate, the lateral somewhat patulous and unequal-sided ; the pods are globose, erect, sessile, and often 2-seeded.

It is allied to *C. axilliflora*, Bak. fil.

94. C. ALEXANDERI, *Bak. fil.*, sp. nov.

Annua, erecta, ubique pilis cinereis dense obtecta, ramulis adscendentibus, circ. 25 cm. alta. *Folia* trifoliolata, foliolis oblanceolatis 4–9 mm. longis 1–2·5 mm. latis, petiolo communi sæpius 2–3 mm. longo instructa. *Flores* parvi, in foliorum axillis brevissime pedicellati. *Calyx* pilis dense obtectus, 3–4 mm. longus, laciniis lanceolatis. *Vexillum* circ. 5 mm. longum, dorso pilis obtectum. *Carina* dorso angulata, in toto circ. 5 mm. longa, apice rostrata. *Legumen* globosum vel subglobosum calyce longius, sessile, pilis obtectum, plurispermum, pedicellis erectis vel suberectis.

BRITISH EAST AFRICA : First and second day's march from Mumias, *A. Whyte* ! Hb. Kew.

This is a close ally of *C. Bequaertii*, Bak. fil. It is an erect annual, with ascending branches, densely clothed with hairs. The flowers are about 5 mm. long, shortly pedicellate in the axils of the leaves. The pods are globose, or subglobose, sessile, few-seeded, the fruiting pedicels erect or suberect.

It is much more densely covered with hairs than *C. Bequaertii*.

95. C. KUIRIRIENSIS, *Bak. fil.*, sp. nov.

Annua. *Caules* erecti, ramosi. *Rami* teretes vel subteretes, virgati, pubescentes. *Folia* simplicia et trifoliolata, foliolis lineari-oblongis vel oblongis 16–20 mm. longis subtus tomentosis, petiolo communi 4–10 mm. longo suffulta. *Flores* parviusculi, numerosi, in axillis foliorum et in racemos terminales dispositi. *Bracteæ* parvæ, angustæ. *Calyx* in toto circ. 4 mm. longus extus tomentosus, dentibus triangularibus. *Vexillum* late obovatum, purpureo-venosum, 6 mm. longum, circ. 6 mm. latum. *Alæ* oblongæ, ±6·5 mm. longæ. *Carina* in toto ±7 mm. longa, dorso angulo recto curvata, inde in rostrum gracilem attenuata. *Legumen* globosum vel subglobosum, pubescens, sessile, sæpe monospermum; pedicelli erecti non cernui.—Ad *C. axillifloram*, Bak. fil., accedens abs qua facile distinguitur foliorum petiolis longioribus, foliolis supremis simplicibus.

ANGOLA: In thickets at Cassuango on the Kuiriri, *Gossweiler* No. 2996! Hb. Mus. Brit.; at Cutchi, *Gossweiler* No. 3140! Hb. Mus. Brit.

An annual herblet with erect habit, leaves soft, flaccid, standard with copper-red venation outside, bright yellow inside.

The distinguishing features of this species are:—The simple upper leaves, and the trifoliolate lower leaves, with narrow, oblong leaflets, the numerous axillary flowers, the densely tomentose calyx, the standard tomentose externally, the carina about 7 mm. long, the subglobose, sessile, erect or suberect, usually monospermous pods.

96. C. AXILLIFLORA, *Bak. fil.*, sp. nov.

Caules virgati, circ. 45 cm. longi. *Folia* trifoliolata, foliolis lineari-oblanceolatis 10–17 mm. longis 3–4 mm. latis, intermediis quam lateralibus paullo majoribus, glauco-viridibus subtus strigoso-pubescentibus, petiolo communi 1–3 rarius 5 mm. longo instructa. *Flores* 1–3-ni, axillares, pedicellis brevibus. *Bracteæ* lineares, pedicellis longiores. *Calyx* fusco-hirsutus, dentibus anguste lanceolatis. *Vexillum* dorso valde hirsutum. *Carina* 7–8 mm. longa, dorso genuflexa, apice incurva, unguiculata. *Ovarium* pilis obtectum.

CONGO REGION: Lake Tanganyika, *Kässner* Nos. 3021! and 2773! Hb. Mus. Brit.

A virgate suffrutex with trifoliolate leaves, and axillary flowers; the leaflets are linear oblanceolate, the pedicels are short, 1–3 mm. long, the standard is very hirsute on the back, and the carina curiously incurved at the very apex.

97. C. MUMBWÆ, *Bak. fil.*, sp. nov.

Annua, erecta, simplex, circ. 60 cm. alta. *Caulis* teres, pubescens. *Folia* trifoliolata, foliolis cuneato-oblanceolatis, intermediis 20–24 mm. longis

3–4 mm. latis, pubescentibus, petiolo communi angustissime alato 7–10 mm. longo instructa. *Flores* plures in axillis pedicellati vel in racemum terminalem dispositi. *Pedicelli* fructiferi erecti vel suberecti, 3–4 mm. longi. *Calyx* circ. 5 mm. longus, dentibus lanceolatis extus pubescentibus. *Carina* in toto 7–8 mm. longa, apicem versus in rostrum rectum et gracilem sensim attenuata. *Legumen* globosum, calyce longius, 4–5 mm. longum, sæpe monospermum.

NORTH RHODESIA: Near Mumbwa, *Mrs. Macaulay* No. 399! Hb. Kew.

An erect plant with flowers from the axils of the leaves and also terminal; the flowers spring in small clusters from the axils, not solitary or subsolitary as in some allied species. The carina has a long, straight, slender rostrum; the total length of the carina is 7–8 mm. The pod is globose, sessile, 1-seeded, and erect, not nodding.

Allied to *C. kuiririensis*, Bak. fil.

98. C. ELISABETHÆ, *Bak. fil.*, sp. nov. (Pl. **10.**)

Erecta, basi suffruticosa, circ. 60 cm. alta, ramis virgatis strigoso-pubescentibus. *Stipulæ* subnullæ. *Folia* glauco-viridia, suprema simplicia, inferiora trifoliolata, foliolorum inferiorum foliolis oblanceolatis apice sæpius emarginatis, lateralibus inæquilateralibus, intermediis 15–18 mm. longis 4–5 mm. latis, utrinque strigoso-pubescentibus, petiolo communi circ. 7–10 mm. longo suffulta. *Flores* in axillis foliorum et in racemum terminalem dispositi. *Calyx* extus pubescens, laciniis lanceolatis. *Vexillum* alis longius, carinæ subæquilongum, pubescens. *Carina* dorso angulo recto curvata, inde in rostrum rectum et gracilem sensim attenuata, in toto circ. ±9 mm. longum. *Legumen* globosum, pilis obtectum, sæpius ±2-spermum, pedicellis erectis.

CONGO REGION: Katanga, Elisabethville, *Homblé* No. 302! *J. Bequaert* No. 446! Hb. Brux.

A virgate, somewhat suffrutescent plant, with flowers in the axils of the leaves and also in a terminal raceme; the carina is about 9 mm. long, the rostrum very acute, the pods globose, sessile, the fruiting pedicels erect.

It is allied to *C. phyllostachys*, Baker.

99. C. PHYLLOSTACHYS, *Baker in Kew Bulletin* (1897) 250.

Suffrutex erectus, simplex vel ramosus. *Rami* lignosi, graciles, virgati, pilis adscendentibus dense vestiti. *Stipulæ* subnullæ. *Folia* trifoliolata, foliolis oblanceolatis linearibus vel lineari-oblongis obtusis mucronatis 12–18 mm. longis 1·5–3·5 mm. latis pallide viridibus facie glabrescentibus dorso pilosis, petiolo communi ±8 mm. longo suffulta. *Pedicelli* dense pubescentes. *Calyx* pilosus, 6 mm. longus, tubo brevi, dentibus lanceolatis. *Vexillum* striatum, 12–13 mm. longum, calyce subduplo longius. *Alæ* carina

breviores. *Carina* ±13 mm. longa, dorso angulo recto curvata, inde in rostrum gracile attenuata. *Legumen* sessile, globosum, ±4 mm. longum, pilosum, monospermum.

NYASALAND: Nyika Plateau, alt. 2000–2300 metres, and between Mpata and the commencement of the Nyasa-Tanganyika Plateau, alt. 760–1000 metres, *Whyte*! Hb. Kew.

Series 20. Flores in racemos laxos dispositi. Carina dorso rectangulari-curvata, inde in rostrum rectum et gracile attenuata, 12–13 mm. longa. Foliola cuneatim obovata. Legumen globosum, plerumque 6-spermum. Suffrutex.

100. C. LEUBNITZIANA, *Schinz in Abhandl. Bot. Verein. Prov. Brand.* xxx. (1888) 158; *Mém. Herb. Boiss.* i. (1900) 129.

Suffrutex glaber vel sparse adpresse pilosus. *Caules* numerosi, ex eadem radice orti. *Stipulæ* parvæ, setaceæ. *Folia* trifoliolata, foliolis glauco-viridibus cuneatim obovatis vel elliptico-obovatis 10–18 mm. longis 5–8 mm. latis, petiolo communi 5–15 mm. longo suffulta. *Racemi* 3–6 cm. longi. *Bracteæ* parvæ. *Bracteolæ* parvæ, ad basin calycis positæ. *Calyx* ±6 mm. longus, pubescens, dentibus acutis. *Vexillum* basi pilosum. *Alæ* carina breviores. *Carina* 11–13 mm. longa. *Legumen* subglobosum, stipitatum, ad 6-spermum.

GREAT NAMAQUALAND: Tiras, *Schinz* No. 534! Hb. Schinz; Kuibis, *Dinter* No. 1229! Hb. Berol.; *Dr. Range* No. 838! Hb. Berol.

Series 21. Flores in racemos laxos dispositi. Carina dorso angulo recto curvata, inde in rostrum attenuata, 7–10 mm. longa. Foliola obovata. Legumen plerumque 6-spermum, subglobosum. Suffrutex.

101. C. DINTERI, *Schinz in Bull. Herb. Boiss.* sér. 2, i. (1901) 875.

Suffrutex ramosus. *Rami* tenuiter cano-pubescentes. *Stipulæ* parvæ, setaceæ. *Folia* trifoliolata, foliolis cuneato-obovatis apice sæpe emarginatis 8·0–12 mm. longis 8–10 mm. latis subtus pubescentibus, petiolo communi 4·0–10 mm. longo suffulta. *Racemi* laxiusculi, 5–10 cm. longi. *Bracteæ* parvæ, lineares. *Bracteolæ* ad basin calycis parvæ. *Pedicelli* 2–3 mm. longi. *Calyx* pubescens, circ. 5 mm. longus; laciniæ circ. 3 mm. longæ. *Alæ* carina breviores. *Carina* 7–10 mm. longa. *Legumen* subglobosum, 7–8 mm. longum, pubescens, plerumque 6-spermum.

HEREROLAND: Windhoek, *Dinter* No. 317! Hb. Turic.

This is not the plant described as *C. Dinteri* in Bull. Herb. Boiss. ser. 2, iii. 819, which is also from Hereroland, Waterburg, *Dinter* No. 583.

Series 22. Flores parvi, vel parviusculi 2–6, apicem versus pedunculorum umbellatim vel subumbellatim dispositi. Carina dorso angulo fere recto curvata, 5–10 mm. longa. Legumina globosa vel subglobosa. Plantæ annuæ vel perennes, caulibus procumbentibus.

102. C. PISICARPA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 16 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 197.

Herba multicaulis, prostrata, ramosissima, tomento brevi induta. *Stipulæ* parvæ. *Folia* trifoliolata, petiolata, foliolis obovatis vel suborbicularibus apice rotundatis vel emarginatis 15–22 mm. longis 7–17 mm. latis utrinque strigoso-pubescentibus. *Flores* flavi. *Pedicelli* tomento brevi induti, supra medium bracteolis 2 linearibus instructi. *Carina* rectangulari-angulata, 5–6 mm. longa. *Legumen* sphæricum, pisiforme, sessile, plerumque 3-spermum.

ANGOLA: Huilla, Lopollo, *Welwitsch* No. 1926! Hb. Mus. Brit., etc.

103. C. PILULICARPA, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 204 (1895).

Annua, e basi ramosa, *C. pisicarpæ*, Welw., subsimilis, ramis gracilibus elongatis procumbentibus pilis incanis villosis. *Stipulæ* minutæ, lineares. *Folia* petiolata, foliolis quam iis *C. pisicarpæ*, Welw., angustioribus oblongis vel obovato-lanceolatis apice mucronatis supra glabris subtus villoso-sericeis. *Racemi* oppositifolii, pedunculo longo muniti, apice umbellatim 3–4-flori. *Flores* flavi, pedicellati. *Calyx* villosus, dentibus lanceolato-subulatis. *Vexillum* late obovatum, ±9 mm. longum, calycem fere duplo superans, suborbiculare. *Ovarium* stipitatum, tomentoso-villosum. *Legumen* distincte breviter stipitatum, globosum, pisi magnitudine, obscure rugulosum, albido-tomentosum, plerumque 1-spermum.

GERMAN EAST AFRICA: Unjamwesi, *Stuhlmann* No. 441! Ipala in Ugogo, *Stuhlmann* No. 351! Hb. Berol.

NYASALAND: Lake Nyasa, *Simons*! Hb. Mus. Brit.

Var. nov. SCHINZII, *Bak. fil.*

Annua, e basi ramosa, ramis gracilibus undique uti petiolis pedunculis pedicellisque pilis patentibus tectis. *Folia* trifoliolata, foliolis oblongis vel ellipticis 20–55 mm. longis 9–10 mm. latis, petiolo communi 10–15 mm. longo suffulta. *Flores* 2–6, parviusculi. *Calyx* totus circ. 6 mm. longus. *Carina* dorso angulo recto curvata, hinc in rostrum sensim attenuata, circ. 6 mm. longa. *Legumen* globosum, albido vel cinereo-tomentosum, sæpius 3-spermum.

AMBOLAND: Olukonda, *Rautanen* Nos. 117! 223! 370! Hb. Turic.; Amboland, *Schinz*! Hb. Schinz.

TRANSVAAL: Pietersburg, *Bolus* No. 10915! Hb. Turic.

104. C. REPTANS, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 204 (1895).

Caulis elongatus, flexuosus, reptans, pilis patentibus vel sursum hirto-villosis obtectus, internodiis sæpe 6–7 cm. longis. *Stipulæ* lineari-lanceolatæ. *Folia* trifoliolata, foliolis ellipticis vel elliptico-obovatis usque ad 32 mm. longis et 15–20 mm. latis rarius lineari-oblongis basi cuneatis supra glabris subtus pilis adpresse instructis, petiolo communi 15–25 mm. longo suffulta. *Flores* mediocres, circ. 10 mm. longi. *Pedunculi* 4·5–10 cm. longi, folia longe superantes, 2–3-flori. *Calyx* hirto-villosus, dentibus lineari-lanceolatis. *Vexillum* rotundo-ovatum. *Alæ* obtusissimæ. *Carina* dorso angulo fere recto curvata 9–11 mm. longa.

UGANDA: Igonda, *Boehm* Nos. 165 & 278 *b*! Hb. Berol.

NYASALAND: Lake Nyasa, Likomo Island, *Archdeacon Johnston* No. 51! Hb. Kew.

Series 23. Flores in racemos laxissimos dispositi. Carina ±5 mm. longa. Legumen sessile, subglobosum, 2–3-spermum. Herba perennis, ramosissima, oligophylla.

105. C. SPARSIFOLIA, *Baker in Kew Bull.* (1897) 249.

Herba erecta, 35–60 cm. alta. *Ramuli* graciles, pilis adscendentibus albidis vestiti. *Stipulæ* subnullæ. *Folia* pauca, trifoliolata, foliolis linearibus vel lineari-oblanceolatis acutis mucronatis 4–8 mm. longis 1–2 mm. latis facie viridibus glabris dorso dense pilosis, petiolo communi 1–3 mm. longo suffulta. *Racemi* laxissime pauciflori, terminales. *Pedicelli* breves. *Bracteæ* parvæ. *Calyx* pilosus, ±3 mm. longus, tubo brevi, dentibus lanceolatis. *Vexillum* dorso sericeo-hirsutum, carinæ subæquilongum. *Alæ* carina breviores. *Carina* cymbiformis, apice rostrata, ±5 mm. longa. *Legumen* sessile, ±4 mm. longum, pilosum, pedicellis erectiusculis.

NYASALAND: Nyika Plateau, alt. 2000–2300 m., and between Kondowe and Karonga, *Whyte*! Hb. Kew.

Series 24. Flores minimi, axillares, solitarii. Carina 4–5 mm. longa, apice acuta. Legumen late ellipsoideum, plerumque 6–7-spermum. Annua.

106. C. MINIMA, *Bak. fil. in Journ. Bot.* xxxiv. (1896) 52.

Caulis erectus, ramosus, circ. 12–15 cm. longus, ramulis pilis albidis appresse obtectis. *Folia* minima, trifoliolata, foliolis oblanceolatis circ. 4 mm. longis præcipue subtus pilis albidis adpressis obtectis, petiolo communi circ. 2 mm. longo instructa. *Flores* inter minores generis, brevipedunculati. *Bracteæ* parvæ, lanceolatæ. *Calycis laciniæ* lanceolatæ, acuminatæ. *Vexillum* ovatum, circ. 5 mm. longum. *Carina* acutiuscula. *Ovarium* sessile. *Legumen* circ. 7 mm. longum.

GALLA HIGHLANDS: Ginia, *Dr. Donaldson Smith*! Hb. Mus. Brit.

Sect. III. **CHRYSOCALYCINÆ**, Benth. in Hooker's Lond. Journ. Bot. ii. (1843) 571; Baker in Oliver, Fl. Trop. Afr. ii., pro parte.

Chrysocalyx, Guill. & Perr. Fl. Seneg. Tent. 158 (1832).

Folia trifoliolata, vel trifoliolata et simplicia. Flores mediocres, in racemos dense spiciformes, vel capituliformes dispositi, vel pauci apicem versus ramulorum aggregati. Carina calycem vix æquans vel paullo superans. Legumina plurisperma, oblonga vel globoso-oblonga, calyce demum aucto breviora, vel vix longiora.

Clavis specierum.

1.	Bracteolæ angustæ	2
	Bracteolæ latæ	*nigricans.*
2.	Flores 2–10 apicem versus ramulorum aggregati vel in capitula dispositi	3
	Flores numerosiores	5
3.	Legumina 1–4-sperma	4
	Legumina 6–10-sperma	*macrocalyx.*
4.	Foliola oblonga, vel lineari-oblonga	*Perrottetii.*
	Foliola oblongo-elliptica	*gracilis.*
5.	Flores dense conoideo-spicati. Legumina 6–8-sperma. Bracteolæ lanceolatæ	*ebenoides.*
	Flores in racemos subglobosos dispositi. Legumina 7–10-sperma. Bracteolæ lineares. Folia fere sessilia	*atrorubens.*
	Flores in capitula densa dispositi. Legumina 6–10-sperma. Foliorum petioli 4–10 mm. longi	*ononoides.*

Series 1. Flores in ramulorum apicibus pauci. Legumina subglobosa, sæpius 1–4-sperma.

107. C. Perrottetii, *DC. Prod.* ii. (1825) 128; *Baker in Oliver, Fl. Trop. Afr.* ii. 19. (Pl. **11 B.**)

C. gambica, Taubert in Engl. Jahrb. xxiii. (1896) 179.

Heylandia Perrottetii, Spreng. Syst. Veg. 267.

Chrysocalyx Perrottetii, Guill. & Perr. Fl. Seneg. Tent. 160, t. 43. fig. 2 (1832).

Caulis herbaceus, 0·3–0·6 m. altus, sericeus, e basi ramosus. *Stipulæ* parvæ, lineares. *Folia* fere sessilia, foliolis superne glabris subtus pilis sericeis conspersis linearibus vel oblongis, intermediis circ. 30–50 mm. longis et 6–10 mm. latis. *Flores* pauci, ad apices ramulorum dispositi. *Calyx* circ. 8–10 mm. longus, extus sericeo-pubescentibus dentibus lanceolatis inferioribus angustioribus. *Corolla* lutea, calycem subæquans. *Legumina* sessilia vel subsessilia, subglobosa, extus dense sericea, 1–4-sperma.

Senegambia: *Perrottet*! Hb. Mus. Brit.; Gambia, *Brown-Lester*, No. 65! Hbb. Kew., Berol.

I do not think *C. gambica*, Taubert, can be maintained as specifically distinct from *C. Perrottetii*, DC.

108. C. gracilis, *Walp. Rep.* i. 591 (1842) ; *Baker in Oliver, Fl. Trop. Afr.* ii. 20.

Chrysocalyx gracilis, Guill. & Perr. Fl. Seneg. Tent. 159 (1832).

Planta annua, laxe diffusa. *Caules* herbacei, graciles, 0·5–0·6 m. alt., suberecti. *Stipulæ* parvæ, lineares. *Folia* fere sessilia, foliolis superne glabris subtus appresse villosis oblongo-ellipticis, intermediis duplo majoribus 30–40 mm. longis 10–14 mm. latis. *Flores* ad ramulorum apices pauci, sæpius 3–4. *Bracteolæ* 2, angustæ, circ. 3 mm. longæ. *Calyx* extus brunneo-sericeus, dentibus lanceolatis. *Corolla* calycem subæquans. *Carina* rostriformis, naviculariformis, circ. 9 mm. longa. *Legumen* subglobosum, breviter villosum, circ. 4-spermum.

Senegambia : *Perrottet* No. 160 ! Hb. Mus. Brit., etc.

Series 2. Flores in racemos densos paucifloros vel plurifloros dispositi. Calyces fructiferi magni. Legumina 6–10-sperma.

109. C. macrocalyx, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 572 ; *Baker in Oliver, l. c.* ii. 20.

Caules herbacei, erecti, vel procumbentes, ramosi, pubescentes. *Stipulæ* parvæ, lineares. *Folia* plerumque trifoliolata, interdum suprema simplicia, foliolis lineari-oblongis vel lanceolatis, intermediis sæpe 40–50 mm. longis 8–10 mm. latis, lateralibus minoribus, subtus pilis dense obtectis, petiolo communi brevissime. *Flores* in capitula globosa ad apices caulium et ramorum disposita. *Bracteolæ* lineares, 6–7 mm. longæ. *Calyx* circ. 11–12 mm. longus (floriferus) vel ±18 mm. longus (fructiferus); laciniæ ovato-lanceolatæ, tubo longiores. *Corolla* lutea, circ. 11–13 mm. longa. *Carina* dorso rotundata. *Legumen* globoso-oblongum, sessile, extus dense sericeo-pubescens.

Senegambia : *Heudelot* No. 209 ! Hb. Kew.

Togoland : Chra Fluss, *Busse* No. 3574 ! Hb. Berol.

Nigeria : *Barter* No. 959 ! Hb. Kew. ; Katagum District, *Dalziel* No. 16 ! Hb. Kew.

Lagos : *Rowland* ! Hb. Kew.

Abyssinia : *Petit* ! Hb. Kew.

The calyx of this plant is densely covered with silky brown hairs, and enlarges in fruit. The standard is about 12 mm. long and 14 mm. broad, the wings are about 12–13 mm. long and the base is unguiculate.

Chrysocalyx Petitiana, A. Rich., is not synonymous with this species, but with *C. Dilloniana*, Baker.

Series 3. Flores in capitula densa dispositi. Calyces fructiferi quam in *C. macrocalyci*, Benth., minores. Legumina 6–10-sperma.

110. C. ebenoides, *Walp. Rep.* i. 590 (1842) ; *Baker in Oliver, l. c.* ii. 20.

Chrysocalyx ebenoides, Guill. & Perr. Fl. Seneg. Tent. 158, t. 43. fig. 1 (1832).

Caulis herbaceus, erectus, 0·3–0·5 m. alt., ramosus, sursum dense sericeus. *Stipulæ* parvæ, lineares. *Folia* fere sessilia, foliolis lineari-oblongis, inter. mediis majoribus 35–50 mm. longis 7–9 mm. latis, subtus pilis dense obtectis. *Flores* in capitula oblongo-conoidea, 2–10 cm. longa, densa dispositi. *Bracteolæ* ad basin calycis lanceolatæ. *Calyx* extus dense brunneo-sericeus. *Corolla* calycem subæquans. *Carina* rostriformis, naviculariformis. *Legumina* subsessilia, globoso-oblonga, circ. 6 mm. longa, 6–8-sperma.

SENEGAMBIA: *Leprieur & Perrottet*! Hb. Mus. Brit.; Galam and the Sahara, *Heudelot* No. 253! Hb. Kew; Koulikoro, *Chevalier* No. 3197! Hb. Kew.

A plant with herbaceous stems, and flowers in a dense, somewhat oblong, conoideal head, 2–10 cm. long.

111. C. ATRORUBENS, *Hochst. in Herb. Kotschy Nub.* No. 265; *Baker in Oliver, Fl. Trop. Afr.* ii. 22 (1871). (Pl. **11 A.**)

Chrysocalyx rubiginosa, Guill. & Perr. Fl. Seneg. Tent. 158 (1832).

Crotalaria iodina, Benth. in Hook. Lond. Journ. Bot. ii. (1843) 572.

Annua, suberecta. *Caulis* firme herbaceus, 0·3–1 m. altus, copiose ramosus, pilis sericeis sparse conspersus. *Stipulæ* parvæ, lineares. *Folia* fere sessilia, foliolis oblanceolatis vel oblongo-oblanceolatis, intermediis majoribus 10–20 mm. longis, subtus pilis sericeis obtectis. *Flores* in capitula densa ad apices caulium ramorumque dispositi. *Calyx* dense brunneo-sericeus, pubescens; lobi lineares. *Bracteolæ* conspicuæ, angustæ. *Corolla* calycem subæquans. *Legumina* oblonga vel oblongo-globosa, sessilia, sæpius 6–9 mm. longa, 7–10-sperma, pilis sparse obtecta.

SENEGAMBIA: *Perrottet* No. 162! Hb. Mus. Brit.

NIGERIA: Nupe, *Barter* No. 1052! Hb. Kew.; Katagum District, *Dalziel*, Hb. Kew.; on the Quorra, *Barter*! Hb. Kew.

GAMBIA: *M. Park*! Hb. Mus. Brit.

SUDAN: Nubia, *Kotschy* No. 265! Hbb. Mus. Brit., Kew.; Kordofan, *Dr. Pfund* Nos. 77! & 220! Hb. Kew.; Gefil, *A. F. Broun* No. 1263! Hb. Kew.

Series 4. Flores in racemos globoso-capitatos dispositi. Capitula intra folia suprema sessilia. Bracteolæ angustæ. Legumen 6–10-spermum.

112. C. ONONOIDES, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 572; *Baker in Oliver, l. c.* ii. 22; *Hiern, Cat. Welw. Afr. Pl.* i. 199; (sphalm. *mononoides*) *De Wild. Notes sur le Fl. de Katanga*, 53.

C. involucrata, Solander MSS. in Hb. Mus. Brit.; Baker, l. c.

Herba e basi ramosa, habitu *Anthyllidis*. *Stipulæ* lineari-subulatæ. *Folia* trifoliolata, foliolis in forma typica oblongo-ellipticis vel oblongo-lanceolatis acutis mucronulatis, sæpius 20–50 mm. longis 5–15 mm. latis supra glabris subtus adpresse pubescentibus, in forma *stenophylla* 40–60 mm. longis

3–6 mm. latis, petiolo communi 4–10 mm. longe prædita. *Bracteolæ* sub calyce lineari-subulatæ. *Calycis laciniæ* lanceolato-subulatæ. *Vexillum* 6–9 mm. longum. *Alæ* oblongæ, carinæ subæquilongæ. *Carina* dorso rotundata, 7–9 mm. longa. *Legumen* glabrum, sessile, 8–10 mm. longum.

The type was from Sierra Leone, *Don* ! Hb. Mus. Brit.

This species is widely distributed in Upper Guinea, Cameroons, Uganda, Haut Oubangui, Bongoland, Angola, Congo Region, British East Africa, Zanzibar, Rhodesia.

Forma STENOPHYLLA, *Welw. MSS.*

Foliola longiora et angustiora, lineari-oblonga vel lineari-lanceolata.

ANGOLA : Golungo Alto, *Welwitsch* No. 1930 ! Hb. Mus. Brit.

Series 5. Flores in capitula globosa disposita. Bracteolæ latæ. Legumina paucisperma.

113. C. NIGRICANS, *Baker in Oliver, Fl. Trop. Afr.* ii. 21 (1871); *Oliver, in Trans. Linn. Soc.* xxix. (1872) 51, tab. 26 A.

Suffrutex 0·3–1 m. altus, pilis griseis brevibus indutus. *Stipulæ* parvæ, ovato-lanceolatæ. *Folia* trifoliolata, in sicco nigrescentia, foliolis oblanceolatis intermediis 12–18 mm. longis ±6 mm. latis, petiolo communi 3·0–5·0 mm. longo suffulta. *Flores* ad apicem caulium et ramorum dispositi. *Bracteolæ* suborbiculares vel ovato-acuminatæ. *Calyx* profunde 4-fidus. *Corolla* calyce brevior. *Carina* dorso rotundata, rostro brevi, unguiculata. *Legumina* immatura globosa, sessilia, sericea.

GERMAN EAST AFRICA : Mininga, *Speke & Grant* No. 183 ! Hb. Kew.

CONGO REGION : Lukifwa, *Kässner* No. 2857 ! Hb. Brux.

NYASALAND : Tanganyika Plateau, Fort Hill, *Whyte* ! Hb. Kew.

The leaves and calyx of this plant turn black when dried. Noticeable on account of the broad bracteoles and petioles 3–5 mm. long.

SECT. IV. **FARCTÆ**, Benth. in Hook. Lond. Journ. Bot. ii. (1843) 583.

Folia trifoliolata. Flores mediocres, in racemos multifloros dispositi. Carina calyce longior, apice rostrata. Stipulæ obsoletæ vel minutæ. Legumina cylindrica vel oblonga, curvata, intus lana farcta.

CLAVIS SPECIERUM.

1.	Carina 15–17 mm. longa. Bracteolæ ovatæ	*leucoclada.*
	Carina 9–11 mm. longa	2
	Carina 6–8 mm. longa	3
2.	Bracteolæ oblongæ, calycis tubo sæpius breviores	*Saltiana.*
	Bracteolæ lineari-lanceolatæ, calycis tubo longiores	*Franchetii.*
3.	Bracteolæ elliptico-ovatæ. Foliola cuneato-obovata	*farcta.*
	Bracteolæ ovatæ vel obovatæ. Foliola obovata vel suborbiculari-obovata	*Thomasii.*

114. C. LEUCOCLADA, *Baker in Kew Bull.* (1895) 214. (Pl. **12 A.**)

Suffrutex erectus, ramosus, albo-incanus. *Stipulæ* inconspicuæ. *Folia* trifoliolata, foliolis cuneato-ellipticis vel cuneato-oblongis 15–35 mm. longis 8–18 mm. latis subtus pubescentibus, petiolo communi 15–26 mm. longo prædita. *Flores* majusculi, lutei, in racemos multifloros dispositi, pedicellis erecto-patentibus. *Calyx* 6–7 mm. longus. *Vexillum* calyce distincte longius. *Alæ* oblongæ. *Carina* dorso rotundata, apice in rostrum attenuata, in toto circ. 15–17 mm. longa. *Legumen* cylindricum, cum stipite circ. 14–18 mm. longum, intus lana farctum.

SOMALILAND : Golis Range, 1000 m., *Mrs. Lort Phillips*! Hb. Kew.; Wagga Mts., *Mrs. Lort Phillips*! Hb. Mus. Brit.

115. C. SALTIANA, *Andrews, Bot. Repository*, t. 648 (1811). (Pl. **12 B.**)

C. lupinoides, Hochst. in Herb. Kotschy Nub. No. 41; Benth. in Hook. Lond. Journ. Bot. ii. 583; Baker ex Oliver, Fl. Trop. Afr. ii. 39.

Suffrutex ramis longis curvatis superne plus minusve sericeis. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis obovatis vel oblongo-obovatis 12–40 mm. longis 8–20 mm. latis subtus sericeo-pubescentibus superne glabris vel glabriusculis, petiolo communi pubescente 15–25 mm. longo instructa. *Flores* lutei, mediocres, in racemos densifloros dispositi. *Bracteolæ* oblongæ. *Calycis* laciniæ lanceolatæ. *Vexillum* elliptico-obovatum, unguiculatum. *Alæ* oblongæ, luteæ. *Carina* dorso rotundata, apice rostrata, in toto 9–11 mm. longa. *Legumen* cylindricum, leviter curvatum, cum stipite 12–16 mm. longum.

SUDAN : Nubia, *Kotschy* No. 41! Hb. Mus. Brit.; between Suakin and Berber, *Schweinfurth* No. 604! Khartoum, *Schweinfurth* No. 589! Dar Matama, *Schweinfurth* No. 1872!

S. ABYSSINIA : Schebelli, *Donaldson Smith*! Hb. Mus. Brit., etc.; Lake Rudolf, East shore, *Capt. Wellby*! Hb. Kew.

116. C. FRANCHETII, *Bak. fil.*, nom. nov.

C. argyræa, Franchet in Revoil Pays Çomalis, 27 (1882), *non* Welwitsch.

Suffrutex. *Caulis* sericeus. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis subtus pubescentibus oblongo-ovatis 10–20 mm. longis 8–10 mm. latis, petiolo communi 15–20 mm. longo suffulta. *Flores* lutei, in racemos densifloros dispositi. *Bracteolæ* angustæ, ad basin tubi calycis adnatæ. *Calyx* circ. 6 mm. longus; laciniæ lanceolatæ, cuspidatæ. *Vexillum* luteum, elliptico-obovatum, cum ungue circ. 11 mm. longum. *Alæ* luteæ, oblongæ, circ. 10 mm. longæ. *Carina* dorso rotundata, in toto circ. 10 mm. longa, margine interiore ciliata. *Ovarium* hirsutum, stipitatum, lineare. *Legumen* deest.

SOMALILAND : Ogda, Ouarsanguelis, *M. Revoil*! Hb. Mus. Paris.

I do not find the setaceous stipules mentioned in the description.

Very closely allied to *C. Saltiana*, Andrews, but with narrower bracteoles and narrower calyx-lobes.

117. C. FARCTA, *R. Brown in Salt Appendix*, p. lxv, nomen.

Frutex copiose ramosus. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis cuneato-obovatis 10–14 mm. longis 6–8 mm. latis strigoso-pubescentibus glauco-viridibus, petiolo communi 5–9 mm. longo instructa. *Flores* parviusculi, in racemos dispositi. *Bracteolæ* elliptico-ovatæ ad basin calycis adnatæ. *Calyx* 4–5 mm. longus; laciniæ lanceolatæ. *Vexillum* luteum, 6–7 mm. longum. *Alæ* oblongæ, luteæ. *Carina* dorso rotundata, apice acuta, in toto circ. 6–7 mm. longa. *Ovarium* pubescens. *Legumen* cylindricum, curvatum, stipitatum, 10–14 mm. longum, hirsutum.

ABYSSINIA: *Salt*! Hb. Mus. Brit.

Allied to *C. Saltiana*, Andrews, but with smaller flowers.

118. C. THOMASII, *Harms in Engl. Jahrb.* xxvi. (1899) 283.

Herba erecta, ramosa, subglabra. *Stipulæ* inconspicuæ. *Folia* trifoliolata, foliolis obovatis vel suborbiculari-obovatis basi sæpius in petiolulum angustatis 15–25 mm. longis 13–20 mm. latis adultis supra glabris subtus minute et adpresse puberulis, petiolo communi 20–30 mm. longo instructa. *Flores* in racemos oppositifolios dispositi. *Racemi* 4–10 cm. longi. *Bracteolæ* obovatæ vel ovatæ, calycis basi adnatæ. *Calyx* subsericeo-pubescens, dentibus lanceolatis, circ. 5 mm. longus. *Corolla* calycem circiter duplo superans. *Vexillum* luteum, circ. 7–8 mm. longum. *Alæ* luteæ, oblongæ. *Carina* dorso rotundata, circ. 7–8 mm. longa, apice acuta. *Legumen* extus sericeo-pubescens, intus denso lana sericea cui semina compluria immersa sunt instructum, circ. 15 mm. longum, subsessile.

BRITISH EAST AFRICA: Witu, *Thomas* No. 57! Hbb. Mus. Brit., Berol., etc.

SECT. V. **SPINOSÆ.**

Folia trifoliolata. Flores parvi vel mediocres, axillares. Legumina globosa, ovoideo-oblonga, obovalia, vel subcylindrica. Suffrutices vel frutices, spinosi, nonnunquam herbæ.

CLAVIS SPECIERUM.

1.	Legumina subglobosa vel ovoidea, 5–7 mm. longa	2
	Legumina ovoideo-oblonga, vel oviformia, vel subcylindrica, 7–30 mm. longa vel ultra	4
2.	Legumina subglobosa, 5–6 mm. longa, sæpius monosperma	*spinosa*, var. *Schlechteri*.

	Legumina ovoidea vel subglobosa, 5–7 mm. longa, sæpissime 2–4-sperma	3
3.	Foliola intermedia 3–5 mm. longa. Carina 9–10 mm. longa	*eremicola.*
	Foliola intermedia 8–14 mm. longa. Carina 6–8 mm. longa	*griquensis.*
4 (*a*)	Legumen ovoideo-oblongum, 7–10 mm. longum, sæpius 6–12-spermum	*spinosa.*
(*b*)	Legumen obovale, ± 13 mm. longum	*spinosa*, subsp. *aculeata.*
(*c*)	Legumen subcylindricum, 19–20 mm. longum, seminibus numerosis	*Claessensii.*
(*d*)	Legumen oviforme, ± 30 mm. longum, seminibus numerosis	*spinosa*, var. *macrocarpa.*

119. C. EREMICOLA, *Bak. fil.*, sp. nov.

C. spinosa, Hochst. var. *microphylla*, Schinz in Herb. Turic.

Fruticulus spinosus, ramosus, spinis patentibus tenuibus 5–13 mm. longis. *Rami* subteretes, cortice flavo vel cinereo obtecti. *Stipulæ* parvæ. *Folia* trifoliolata, parva, foliolis obovatis basi cuneatis apice rotundatis vel emarginatis 2·5–5·0 mm. longis subcrassis glauco-viridibus, petiolo communi 2–3 mm. longo instructa. *Flores* parviusculi vel mediocres, pedicellati, solitarii. *Pedicelli* tenues, 4–6 mm. longi. *Bracteæ bracteolæque* non conspicuæ. *Calyx* in toto 4·5–5·5 mm. longus, dentibus lanceolatis. *Vexillum* carina paullo longius. *Carina* dorso angulo recto curvata, hinc in rostrum gracile sensim attenuata, in toto 9–10 mm. longa. *Legumen* ovoideum, durum, 6–7 mm. longum, subsessile, sæpe dispermum.

Ad *C. spinosam*, Hochst., accedens differt spinis longioribus, foliis crassioribus et minoribus, leguminibus ovoideis.

GREAT NAMAQUALAND: Veldschoenhorn, in deep sand, *Dinter* No. 1156! Feb. 1898, Hbb. Berol., Zurich.

A very distinct suffrutex with slender, spiny branches, small, rather thick leaves, solitary flowers, and ovoid or subovoid pods.

120. C. GRIQUENSIS, *Bolus in Journ. Linn. Soc., Bot.* xxiv. (1887) 174. (Pl. **13A.**)

Fruticulus ramosus ad *C. spinosam*, Hochst., accedens, a qua primo intuitu leguminibus subglobosis et habitu diversa ramis magis dichotome divaricatis facile distinguitur, 10–20 cm. altus. *Rami* spinis tenuibus instructi. *Stipulæ* subulatæ. *Folia* trifoliolata, foliolis obovatis 8–14 mm. longis superne glabris subtus sericeis, petiolo communi 3–5 mm. longo suffulta. *Flores* aurei, pauci, 1–2 in spinis racemosi, penduli. *Bracteæ* minimæ. *Pedicelli* 2–3 mm. longi. *Calyx* 4–5 mm. longus. *Carina* calyce $1\frac{1}{2}$–2-plo longior, in toto 6–8 mm. longa. *Legumen* subglobosum, stipitatum, circ. 5 mm. diam., sericeo-pubescens, 2–4-spermum.

GRIQUALAND WEST: Near Kimberley, *Bolus* No. 6802, Hb. Bolus; *Dr. Marloth* in Herb. Norm. Austr. Afr. No. 408! Hb. Mus. Brit.; Near the Vaal River, *Burchell* No. 1782! Hb. Kew.

Differs from *C. spinosa*, Hochst., in its habit and shorter, fewer-seeded pods. It is tolerably abundant about Kimberley.

121. C. SPINOSA, *Hochst. in Herb. Schimp.* i. No. 150, iii. No. 1540, *et in Flora*, xxiv. I. *Intell.* 32 (1841); *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 576; *Baker in Oliver, Fl. Trop. Afr.* ii. 17; *Hiern, Cat. Welw. Afr. Pl.* i. 197. (Pl. **13 B.**)

Herba erecta vel adscendens, vel suffruticosus, spinis patentibus rigidis, ramulis griseo-pubescentibus. *Stipulæ* lineares, breves. *Folia* parvula, trifoliolata, foliolis obcordato-oblongis aut truncato-cuneatis sæpius 10–15 mm. longis subtus cum petiolo hirtis, petiolo communi sæpius 3–5 mm. longo instructa. *Flores* formæ typicæ parvi, in spinis dispositi. *Calycis laciniæ* lanceolatæ. *Vexillum* luteum, calyce longius. *Carina* dorso angulo recto curvata, inde in rostrum rectum attenuata, in toto in forma typica 5–8 mm. longa. *Legumina* formæ typicæ sessilia, oblonga vel obovata, 7–10 mm. longa, pubescentia, 8–10-sperma,

Widely distributed in Tropical Africa.

Subsp. C. ACULEATA, *De Wild. in Ann. Mus. Congo, Bot.* sér. 4, i. 185 (1902–3), t. 46, pro sp.

Caulis erectus, pubescens, spinosus. *Folia* trifoliolata, petiolata, foliolis obovalibus basi cuneatis 3·5–8 mm. longis 1·5–2·5 mm. latis superne glabris subtus pubescentibus, petiolo communi 3–4 mm. longo instructa. *Flores* solitarii vel gemini, in spinis dispositi. *Bracteolæ* minimæ. *Calyx* 5–6 mm. longus, sericeus, dentibus lanceolatis. *Vexillum* circ. 12 mm. longum et 8 mm. latum, ovale, supra unguem bicallosum. *Carina* dorso angulo recto curvata, inde in rostrum sensim attenuata, in toto 10–12 mm. longa. *Legumina* sessilia, obovalia, circ. 13 mm. longa, seminibus glabris.

CONGO REGION: Katanga, Lukafu, *Verdick* No. 106! Hb. Brux.! Mt. Kundelungu, *Kässner* No. 2719! Hb. Mus. Brit.; No. 2713! (forma foliolis longioribus) Hb. Mus. Brit.

The typical form of *C. spinosa*, Hochst., which occurs commonly in Abyssinia, is a plant with small flowers, and small pods, 7–10 mm. long. In subsp. *aculeata* the flowers are larger and the pods are longer, but it is connected with the type by various intermediate forms.

Var. nov. SCHLECHTERI, *Bak. fil.*

Suffrutex ramosus, spinosus. *Folia* trifoliolata, foliolis parvis oblanceolatis vel oblongo-oblanceolatis, intermediis 5–9 mm. longis, lateralibus brevioribus, petiolo circ. 1–2 mm. longo suffulta. *Flores* parviusculi, axillares, pedicellati. *Calyx* totus 3–5 mm. longus, dentibus lanceolatis.

Vexillum suborbiculari-obovatum, luteum. *Carina* dorso angulo recto curvata, inde in rostrum sensim attenuata, in toto 5–6 mm. longa. *Legumen* globosum, extus cinereo-pubescens, 5–6 mm. longum, sæpius monospermum.

TRANSVAAL: In the plain at the foot of Mt. Macalisberg, alt. 1500 metr. *R. Schlechter* No. 3675! Hb. Turic. in flower and fruit, 9 Nov. 1893.

Allied to *C. eremicola*, Bak. fil. Noticeable on account of the small flowers and generally one-seeded pod.

Var. nov. MACROCARPA, *Bak. fil.*

Flores majores. *Legumen* oviforme, ± 30 mm. longum, sessile.

N. RHODESIA: Mumbwa, *Mrs. Macaulay* No. 627! Hb. Kew.

122. C. CLAESSENSII, *De Wild. in Ann. Mus. Congo, Bot.* sér. 5, iii. 410 (1912).

Rami erecti, pubescentes, spinosi. *Stipulæ* reductæ. *Folia* distanter fasciculata, trifoliolata, foliolis cuneato-obovatis ad 12 mm. longis et 4 mm. latis superne glabrescentibus subtus velutinis, petiolo 8–12 mm. longo prædita. *Flores* solitarii vel subsolitarii. *Pedicelli* circ. 4 mm. longi, bibracteolate. *Corolla* calyce longior. *Carina* dorso angulo fere recto curvata, in toto 10–11 mm. longa. *Legumen* sessile, subcylindricum, 19–20 mm. longum, pilis adpressis obtectum, seminibus numerosis.

UGANDA: Mabuku, *Scott Elliot* No. 7900! Hb. Mus. Brit.; Ankole, *Scott Elliot* No. 7487! Hb. Mus. Brit.

CONGO REGION: Kindu, *Claessens* No. 500. Hb. Brux.

SECT. VI. **EUCROTALARIA.**

Folia sæpissime trifoliolata, rarius 4–5-foliata. Flores maximi, mediocres vel parvi, sæpissime in racemos dispositi, rarius solitarii vel subsolitarii. Corolla sæpius calyce longior, rarius calycem subæquans. Legumina oblonga, oviformia vel cylindrica, sessilia vel stipitata, nunquam globosa. Herbæ, suffrutices vel frutices, haud spinosi.

Subsectio 1. GRANDIFLORÆ. Stipulæ parvæ vel angustæ vel obsoletæ. Flores maximi vel majusculi in racemos dispositi. Carina sæpius 16–55 mm. longa (p. 314).

Subsectio 2. MEDIOCRIFLORÆ. Stipulæ parvæ vel anguste vel obsoletæ. Flores mediocres, in racemos vel rarius in extremitate pedunculorum dispositi. Carina sæpius 11–15 mm. longa (p. 330).

Subsectio 3. PARVIFLORÆ. Stipulæ parvæ vel angustæ vel obsoletæ. Flores parvi vel parviusculi, in racemos dispositi vel nonnunquam in extremitate pedunculorum dispositi. Carina sæpius 4–10 mm. longa (p. 362).

Subsectio 4. Oliganthæ. Stipulæ parvæ vel angustæ vel obsoletæ. Flores pauci, sæpius 1–3. Carina 5–20 mm. longa (p. 386).

Subsectio 5. Stipulosæ. Stipulæ plus minus foliaceæ (p. 403).

Subsect. 1. GRANDIFLORÆ.

Stipulæ parvæ vel angustæ vel obsoletæ. Flores maximi vel majusculi, in racemos dispositi. Carina 16–55 mm. longa.

Clavis specierum.

1.	Calyx 11–30 mm. longus	2
	Calyx 4–10 mm. longus	13
2.	Flores maximi vel magni. Carina 20–55 mm. longa	3
	Flores majusculi. Carina 16–19 mm. longa	10
3.	Carinæ rostrum longum vel longiusculum	4
	Carinæ rostrum breve vel breviusculum	9
4.	Flores iis *C. agatifloræ*, Schweinf., subsimiles. Carina oblique oblonga-ovata, 35–55 mm. longa	5
	Flores iis *C. laburnifoliæ*, L., subsimiles. Carina dorso rotundata, 20–35 mm. longa	7
5.	Alæ lamina sæpius 19–35 mm. longa. Calyces glabri vel villosuli	6
	Alæ lamina sæpius 15–19 mm. longa. Calyx glaber	*megistantha.*
6 (*a*)	Racemi 10–25-flori. Foliola elliptica, subtus glabra vel pubescentia. Calyx glabrescens	*agatiflora.*
(*b*)	Racemi 3–10-flori. Foliola quam in *C. agatiflora* minora	*agatiflora*, subsp. [*Erlangeri.*
(*c*)	Racemi circ. 10-flori. Foliola elliptico-oblonga, subtus dense tomentosa. Calyx ad basin villosulus	*Engleri.*
(*d*)	Racemi multiflori. Foliola oblonga vel ovato-oblonga, subtus subargenteo vel subaureo-tomentosa, in sicco non nigrescentia. Calyx villosulus	*imperialis.*
(*e*)	Racemi 10–25-flori. Foliola elliptico-obovata, in sicco sæpius nigrescentia, subtus tomentosa. Calyx villosulus	*Dawei.*
7.	Bracteæ parvæ	8
	Bracteæ magnæ. Foliola lanceolata-oblonga vel ovata	*grandibracteata.*
8 (*a*)	Foliola ovalia vel obovato-oblonga. Petioli 4–8 cm. longi	*laburnifolia.*
(*b*)	Foliola oblonga. Petioli 1·5–3 cm. longi	*Eldomæ.*
(*c*)	Foliola lineari-oblonga vel obovato-oblonga. Petioli usque ad 10–12 cm. longi	*petiolaris.*
(*d*)	Foliola parva, crassiuscula. Petioli 20–45 mm. longi	*pseudospartium.*
9.	Racemi breves, densiflori. Petioli 8–12 mm. longi	*lachnosema.*
	Racemi mediocres, laxi. Petioli 30–60 mm. longi	*tabularis.*
10.	Legumina oblongo-cylindrica, ferrugineo-tomentosa, sessilia	*lachnocarpioides.*
	Legumina oblonga, basi in stipitem attenuata	*mauensis** (p. 342).
	Legumina glabra vel pubescentia, longe stipitata	*macrocarpa.*
	Legumina magna, villosa, sessilia vel subsessilia	11
11.	Folia trifoliolata	12
	Folia 3–5-foliolata, foliolis lineari-lanceolatis	*Burkeana.*

* Owing to the difficulty of placing certain species in their subsections, they have been included in more than one, and their position is shown by a reference to the proper page.

12	(*a*) Rufo-villosa. Racemi 6–∞-flori. Foliola obovato-elliptica....	*polysperma.*
	(*b*) Villosa. Racemi pauciflori. Foliola minora, ovata vel elliptica.	*polysperma,* subsp. *Winkleri.*
	(*c*) Suffrutex pilis griseis indutus. Racemi 3–12-flori. Foliola oblonga, ovato-oblonga vel ovato-lanceolata. Vexillum magnum	*polysperma,* subsp. *Stewartii.*
	(*d*) Annua, pube brevi griseo induta. Racemi 6–12-flori. Foliola obovata. Vexillum parviusculum	*polysperma,* subsp. *Grantii.*
13.	Flores semper in racemos dispositi	14
	Flores in racemos vel solitarii........	24
14.	Racemi breves vel mediocres	15
	Racemi elongati	18
15.	Calyx sæpius 4-6 mm. longus........	16
	Calyx 7–10 mm. longus	17
16.	Planta occidentalis. Carina 15–17 mm. longa........	*ochroleuca.*
	Planta orientalis. Carina $\pm$20 mm. longa	*brevidens.*
17.	Foliola ovata vel suborbiculari-obovata. Planta somalensis ..	*Çomanestiana.*
	Foliola oblonga vel elliptica. Planta intertropicalis	*Mildbraedii.*
	Foliola anguste oblonga. Planta orientalis	*Prittwitzii.*
	Foliola obovata vel elliptica. Planta occidentalis	*griseofusca* (p. 360).
18.	Carina falcata	19
	Carina dorso angulo recto curvata, inde in rostrum longum et rectum attenuata	21
	Carina dorso genuflexa. Vexillum eleganter lineatum	22
	Carina dorso rotundata. Vexillum eleganter lineatum	23
19.	Foliola 3........	20
	Foliola 5, rarius 3	*cleomifolia* (p. 350).
20.	Foliola oblonga vel anguste elliptica. Carina 18 mm. longa ..	*Schumanniana* (p. 350).
	Foliola ovato-oblonga vel elliptico-oblonga. Carina 16 mm. longa	*Muntzneri* (p. 350).
21.	Legumen sessile, oblongo-oviforme........	*Macaulayæ.*
	Legumen stipitatum, obovato-globosum	*aurea* (p. 335).
	Legumen stipitatum, oblongum........	*macrocarpa.*
22.	Foliola linearia vel lineari-lanceolata........	*intermedia.*
23.	Foliola oblonga vel oblongo-elliptica	*cannabina.*
	Foliola oblongo-elliptica vel oblanceolata. Alæ majores, $\pm$18 mm. longæ	*purpureo-lineata.*
24.	Folia 3-4-foliolata. Foliola elliptica vel cuneato-obovata, 5–10 mm. longa. Planta delagoensis	*Monteiroi* (p. 387).
	Folia trifoliolata. Foliola obovata vel oblonga, 15–25 mm. longa. Planta lukwangulensis	*lukwangulensis* (p. 389).

Series 1. Flores maximi. Carina oblique oblongo-ovata, 35–55 mm. longa. Hujus seriei legumina mihi cognita longissime stipitata, oblongo-cylindrica. Frutices.

123. C. AGATIFLORA, *Schweinfurth in von Höhnel zum Rudolph und Stephanie See*, Anhang 13 (1892) ; *Bot. Mag.* t. 8505.

Frutex erectus. *Stipulæ* lineares, sæpe delapsæ. *Folia* trifoliolata, foliolis ellipticis intermediis 40–70 mm. longis et circ. 17–25 mm. latis subtus fere

glabris vel tenuiter pubescentibus, lateralibus circ. 40–60 mm. longis et 13–24 mm. latis, petiolo communi sæpius 4–10 cm. longo prædita. *Bracteæ* ovato-lanceolatæ. *Calycis lobi* 4 superiores per paria connati, inferior angustior. *Vexillum* circ. 45–50 mm. longum et 30 mm. latum. *Alæ* lamina 20–30 mm. longa, 6–12 mm. lata. *Carina* apice in rostrum attenuata, 4–4·5 cm. longa. *Legumen* glabrum, stipitatum, cum stipite in toto circ. 7–8 cm. longum, 15–20-spermum.

British East Africa : Nairotia West, foot of Aberdare Mts., *Von Höhnel* No. 95 ! Hb. Schweinf. ; alt 2176 m., *Sir Evan James* ! Hb. Kew. ; Kijabi, *M. Evans* No. 736 ! Hb. Kew. ; Nairobi, *Battiscombe* No. 48 ! Hb. Kew. ; Muka, *Kässner* No. 702 ! Hb. Kew.

Uganda : S. Buddu, *Dawe* No. 330 ! Hb. Kew.

German East Africa : Kilimanjaro, *Volkens* No. 1681 ; Hbb. Berol., Mus. Brit.

Subsp. C. Erlangeri, *Harms in Herb. Berol.*, pro sp.

Frutex circ. 1 m. altus. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis ellipticis 20–35 mm. longis 7–11 mm. latis, petiolo communi 13–20 mm. longo suffulta. *Flores* maximi, iis *C. agatifloræ*, Schweinf. subsimiles. *Racemi* 3–7-flori. *Calyx* 20–25 mm. longus ; lobi superiores connati, inferior angustior. *Alæ* lamina ± 35 mm. longa et ± 12 mm. lata. *Carina* dorso rotundata, apice in rostrum attenuata, circ. 45 mm. longum.

Harrar : Gara Mulata, *Ellenbeck* No. 542 ! Hb. Berol.

Very near *C. agatiflora*, Schweinf., differs by its smaller leaves and fewer-flowered racemes. Flowers golden-green.

124. C. Engleri, *Harms in Engl. Die Vegetation der Erde*, I. i. 338, t. 303 (1910).

Frutex sec. cl. detectorem circ. 3 metralis. *Caulis* rufo- vel fusco-tomentosus. *Stipulæ* subnullæ. *Folia* trifoliolata, foliolis elliptico-oblongis apice basique acutis 40–70 mm. longis 14–24 mm. latis subtus dense tomentosis, petiolo brunneo-tomentoso 40–80 mm. longo suffulta. *Flores* iis *C. imperialis*, Taubert, subsimiles. *Calyx* totus circ. 25 mm. longus. *Vexillum* circ. 35 mm. longum. *Alæ* carina multo breviores. *Carina* circ. 4 cm. longa. *Pedicelli* sub anthesin circ. 10 mm., fructiferi circ. 15 mm. longi. *Legumen* glabrum, circ. 50 mm. longum et circ. 18 mm. latum, stipite circ. 10–15 mm. longo suffultum.

German East Africa : West Usambara, Magamba, *Dr. Engler*, No. 1277 ! Hb. Berol.

Allied to *C. imperialis*, Taubert.

125. C. Dawei, *Bak. fil.*, sp. nov.

Frutex ad *C. imperialem,* Taubert, valde accedens, ramulis petiolis foliolis subtus pube brevi dense obtectis.

Folia trifoliolata, elliptico-obovata, intermediis majoribus 40–65 mm. longis 28–33 mm. latis petiolulatis, petiolo communi 55–75 mm. longo instructa. *Flores* maximi, in racemos laxos sæpius 10–25-floros dispositi. *Pedicelli* filiformes. *Bracteolæ* minutæ. *Calycis lobis* superiore per paria connati, inferiore angustiore. *Carina* dorse rotundata, apice in rostrum attenuata, in toto 45–50 mm. longa. *Alæ* carina conspicue breviores. *Ovarium* stipitatum. *Legumen* longissime stipitatum, oblongum vel oblongo-oviforme.

Uganda: Buddu, Dumu, *Dawe* No. 6 ! Hb. Kew. ; Muzosi, *A. Bagshawe* No. 46 ! Hb. Mus. Brit.

A shrub about 10 feet high, closely allied to *C. imperialis,* Taubert, but the leaflets are shorter and broader, and the calyx is different. The flowers are greenish-yellow, the same shape as those of *C. imperialis,* the pedicels slender, 15–20 mm. long, the calyx 25–30 mm. long, with scattered hairs.

It differs entirely from *C. agatiflora,* Schweinf., by the dense greyish tomentum clothing the branchlets, petioles, and undersides of the leaflets.

126. C. imperialis, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 206 (1895). (Pl. **14 A.**)

Frutex 3–5 met. altus, ramis petiolis racemisque subargenteo- vel subaureo-tomentosis vel subvilloso-tomentosis. *Folia* petiolata, trifoliolata, foliolis oblongis vel ovato-oblongis apice breviter acuminatis 5–11 cm. longis 2–4 cm. latis. *Flores* in racemos elongatos multifloros dispositi, rhachi angulata, floribus pedicellatis. *Calyx* villosulus, 18–20 mm. longus, dentibus lanceolatis subcuspidatis superioribus cum lateralibus fere usque ad apicem connatis. *Vexillum* circ. 4 cm. longum, basi unguiculatum. *Alæ* ovato-oblongæ, calyce longiores. *Carina* basi unguiculata, dorso rotundata, apice in rostrum attenuata, cum ungue circ. 3·5–4 cm. longa. *Legumen* longe stipitatum, oblongo-cylindricum, circ. 6 cm. longum, glabrum, stipite circ. 2 cm. longo suffultum.

British East Africa: Lamuru, *Scheffler* No. 266 ! Hb. Mus. Brit.

German East Africa: Bukoba, *Stuhlmann* Nos. 1113 ! 1575 ! 3922 ! 4068 ! Kirére in Mpororo, *Stuhlmann* No. 2039 ! Hb. Berol.

127. C. megistantha, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 206 (1895).

Frutex videtur ramis foliisque adhuc ignotis. *Racemi* laxiflori, rhachi compresso-quadrangulares. *Flores* maximi, pedicellates. *Bracteæ* supra pedicelli glabri basin setaceæ. *Calyx* totus 25–28 mm. longus, membranaceo-foliaceus, glaber, tubo amplo curvato campanulato, dentibus lineari-lanceolatis

eo dimidio longioribus. *Vexillum* reflexum, obovato-cordatum, apice subcucullatum, ungue intus albo-tomentoso, quam vexillum *C. agatiflorae*, Schweinf., minor. *Alae* falcatæ, oblongo-ovatæ, obtusissimæ, auriculo uti unguis albo-villoso, quam vexillum fere dimidio breviores, 15–20 mm. longæ, 6–9 mm. latæ. *Carina* 35–40 mm. longa, vexillum superans, oblique oblongo-ovata, apice longe rostrata, basi auriculis unguibus villoso-ciliatis marginibus lanato-ciliatis. *Ovarium* stipitatum, glabrum ; stylus intus superne barbatus.

German East Africa : Pangani, *Fischer* No. 334 ! Hb. Berol.

Goetze No. 1311, from Ummamba, is allied to the above, but the wings are broader.

Series 2. Flores magni, in racemos laxos pluri- vel multifloros dispositi. Stipulæ parvæ vel obsoletæ. Carina sæpius dorso rotundata, apice in rostrum subito attenuata, in toto 20–35 mm. longa. Hujus seriei legumina mihi cognita longe stipitata. Frutices vel suffrutices.

128. C. laburnifolia, *Linn. Sp. Pl.* 715 (1753) ; *DC. Prod.* ii. 130 ; *Baker in Hook. fil. Fl. Brit. Ind.* ii. 84.

C. Helenæ, Buscal. & Muschler in Engl. Jahrb. xlix. (1913) 470.

Clavulium pedunculosum, Desv. in Ann. Sc. Nat. sér. 1, ix. (1826) 407.

Caulis suffruticosus, erectus, glaber. *Stipulæ* nullæ. *Folia* trifoliolata, foliolis ovalibus vel obovato-oblongis apice obtusis vel mucronatis 15–45 mm. longis 15–30 mm. latis utrinque glabris, petiolo communi 4–8 cm. longo suffulta. *Flores* majusculi, in racemos multifloros elongatos dispositi. *Bracteæ* subulatæ, minutæ. *Bracteolæ* minutæ, infra medio pedicelli positæ. *Flores* flavi. *Calyx* glaber, laciniis anguste triangularibus acuminatis. *Vexillum* lineatum. *Carina* dorso rotundata, apice subito in rostrum attenuata, rostro sursum flexo, in toto 15–25 mm. longa. *Legumen* insigniter stipitatum, glabrum, cylindrico-oblongum, stipite quam calyce longiore, circ. 20-spermum vel ultra.

Sudan : Upper Nile, Fashoda, *Sir S. Baker* No. 94 ! Hb. Schweinf.

British East Africa : Kibwesi, *Scheffler* No. 76 ! Hb. Berol. ; Witu, *Thomas* No. 186 ! Hb. Kew. ; Taita Hills, *A. Grenfell* ! Hb. Kew. ; Elgon District, *Sir Evan James* ! Hb. Kew. ; near Rabai, *Hildebrandt* No. 230 ! Hb. Kew. ; Sekoki Forest, *Battiscombe* No. 475 ! Hb. Kew.

German East Africa : Usambara, *Holst* No. 3200 ! Hb. Berol. ; Sabaki River, *Kirk* ! Hb. Kew. ; Kilimanjaro, *Merker* ! Muansa, *Stuhlmann* No. 4673! Between Kilimanjaro and Merue, *Uhlig* No. 27 ! Hb. Berol.

Rhodesia : Victoria Falls, *Allen*, Hb. Kew. ; Manica, *Johnston*! Hb. Kew.

Transvaal : Barberton, *Gilpin* Nos. 845 ! & 917 ! Hb. Kew. ; Houtbosh, *Rehmann* No. 6257 ! Hb. Kew.

It also occurs in India, Ceylon, the Philippines, and the Malay Islands.

I do not think *C. Helenæ*, Buscal. & Muschler can be retained as a distinct species. It comes from Guasso Nyiro (*Herzogin Helena von Aosta* No. 1595).

129. C. ELDOMÆ, *Bak. fil.*, sp. nov.

Suffrutex ad *C. laburnifoliam* valde accedens, a qua primo intuitu foliolis angustioribus facile distinguitur. *Erectus*, ramosus, ramulis teretibus glabris. *Stipulæ* obsoletæ *Folia* trifoliolata, foliolis petiolulatis oblongis vel oblongo-oblanceolatis apice acutis basi cuneatis 10–20 mm. longis sæpius 3–5 mm. latis, petiolo communi 15–25 mm. longo instructa. *Flores* magni, iis *C. laburnifoliæ* subsimiles, in racemos paucifloros axillares dispositi, pedicellati. *Pedicelli* bracteolis minimis instructi. *Bracteæ* parvæ, lineares, persistentes. *Calyx* glaber, vel parce puberulus. *Alæ* carina multoties breviores. *Carina* dorso rotundata, apice in rostrum subito attenuata, rostro sursum flexo, in toto 25–30 mm. longa, unguiculata, dorso puberula. *Ovarium* lineari-oblongum, fere glabrum, stipitatum.

BRITISH EAST AFRICA : Between Kitsuya and Eldoma, *A. Whyte* ! Hb. Kew., 1898.

A close ally of *C. laburnifolia*, from which it differs by the inflorescence and narrower leaflets. It differs from *C. petiolaris*, Franchet, in the much shorter petioles, and from *C. grandibracteata*, Taubert, in the much smaller bracts. The distinguishing features are the few-flowered lateral racemes, the small persistent bracts and the narrow leaflets.

130. C. PETIOLARIS, *Franchet in Revoil Çomalis*, 26 (1882).

Fruticulus levis ad *C. laburnifoliam* accedens, ramosissimus, glaucescens, ramis gracilibus flexuosis. *Stipulæ* nullæ. *Folia* petiolo usque ad 10–12 cm. longo suffulta, foliolis pro ratione petioli parvis glabris vel subtus in nervo parce setulosis obovato-oblongis intermedio quam lateralibus duplo longiore. *Pedunculi* oppositifolii, elongati, 3–5-flori, laxi. *Pedicelli* minute bracteati. *Calyx* pedicellum subæquans, late campanulatus, ultra medium 5-lobatus, lobis lanceolatis acutis, inferiore sensim longiore et angustiore. *Corolla* lutea, circ. 2 cm. longa. *Carina* ei *C. laburnifoliæ* subsimilis, longe rostrata. *Legumen* ignotum.

SOMALILAND : Golis Kange at Hammar, *Miss Edith Cole, Mrs. Lort Phillips* ! Hb. Kew. ; without precise locality, *Revoil* ! Hb. Mus. Paris.

Var. nov. AUSTRALIS, *Bak. fil.*

Suffrutex glaber. *Foliola* trifoliolata, foliolis anguste oblongis, petiolo communi 6–11 cm. longo suffulta. *Flores* majusculi, in racemos laxos dispositi. *Bracteæ* parvæ, angustæ. *Carina* dorso rotundata. *Legumen* stipitatum.

RHODESIA : Victoria, *C. F. H. Monro* No. 651 ! Hb. Mus. Brit.

TRANSVAAL : Pietersberg, *H. Bolus* No. 10375 ! Hb. Kew. ; Pineersrivier Berg, *R. Schlechter* No. 4210 ! Hb. Turic.

C. aurantiaca, Baker, in Kew Bull. (1895) 213, hardly differs specifically from *C. petiolaris*, Franchet. The flowers are rather larger, and the leaflets linear-oblong.

131. C. PSEUDOSPARTIUM, *Bak. fil.*, sp. nov.

Suffrutex erectus, ramosus, circ. 35 cm. altus vel ultra, habitu *Spartii* subsimilis. *Caulis* teres, glaber, flavo-viridi-corticatus, striatus. *Folia* trifoliolata, foliolis vix evolutis crassiusculis parvulis glauco-viridibus, petiolo communi tereti 20–45 mm. longo suffulta. *Racemi* pauciflori. *Flores* inter majores generis iis *C. laburnifoliæ* subsimiles. *Bracteolæ* angustæ, lineares. *Calycis tubus* campanulatus, dentibus lanceolatis. *Alæ* carina breviores, oblongæ. *Carina* in toto 28–30 mm. longa, dorso rotundata, apice in rostrum 12–15 mm. longum subito attenuata. *Legumen* glabrum, oblongo-cylindricum, ±4 cm. longum, stipite ±9 mm. longo suffultum.

BRITISH EAST AFRICA: Kikuju, *Scott Elliot* No. 6607! Alt. 1500–1800 metres. Hb. Kew., etc.

The noticeable features of this plant are:—(*a*) the terete, erect, somewhat striate, glabrous stem; (*b*) the terete petioles and somewhat thick leaflets; (*c*) the very few-flowered raceme; (*d*) the large yellow flowers, allied in structure to *C. laburnifolia*, Linn., and *C. petiolaris*, Franchet; (*e*) the glabrous, stipitate, oblong-cylindrical pods.

132. C. GRANDIBRACTEATA, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 206 (1895).

Frutex ramulis teretibus glabris. *Folia* trifoliolata, foliolis lanceolatis oblongis vel ovatis novellis sericeis adultis glabris, petiolo circ. 5–6 cm. longo suffulta. *Flores* maximi, pauci, pedicellati. *Bracteæ* magnæ, ovato-rotundatæ, mucronatæ, 7–8 mm. longæ, pedicellis medio bracteolis minutis instructis. *Vexillum* late ovale, circ. 28–30 mm. longum, ungue crasso intus albo-lanato. *Alæ* oblique oblongæ, circ. 15–18 mm. longæ. *Carina* dorso rotundata, apice longe rostrata, quam vexillum paullo longior, 25–30 mm. longa. *Legumen* glabrum, stipitatum, circ. 4 cm. longum, stipite circ. 2 cm. longo suffultum.

GERMAN EAST AFRICA: Usambara, Mlalo, *Holst* No. 521! Usambara, *Holst* No. 8728! East Usambara, *Engler* No. 803! Usambara, Bumbuli, *Meinhof* No. 77! Lutindi, *Liebusch*! Hb. Berol., etc.

Series 3. Flores mediocres vel majusculi, in racemos laxos 3–∞-floros dispositi. Carina dorso genuflexa, 15–20 mm. longa. Stipulæ angustæ. Calycis lobi longi. Hujus seriei legumina mihi cognita inflata, oblonga vel oviformia, plus minus villosa. Herbæ vel suffrutices, villosi vel pube griseo induti. Bracteolæ ad basin calycis 2, conspicuæ. Folia 3-rarius 5-foliolata.

133. C. POLYSPERMA, *Kotschy, Reliq. Kotschy*, 18, t. 14 (1868) ; *Baker in Oliver, Fl. Trop. Afr.* ii. 42.

C. macrocarpa, Penzig in Atti Congr. Bot. (1892), Piante Bogos, *non* E. Mey.

Herbacea, rufo-villosa. *Rami* teretes. *Stipulæ* angustæ, filiformes. *Folia* trifoliolata, foliolis obovato-ellipticis acutis 20–50 mm. longis 10–25 mm. latis utrinque adpresse sericeo-villosis, petiolo communi 15–30 mm. longo suffulta. *Racemi* laxe floriferi, folia superantes. *Bracteæ* angustæ, 4–5 mm. longæ. *Bracteolæ* ±6 mm. longæ, ad basin calycis positæ, conspicuæ. *Calyx* 14–16 mm. longus, profunde partitus. *Vexillum* late obovatum, extus sericeo-pubescens, 14–16 mm. longum. *Alæ* oblongæ, apice obtusæ. *Carina* apice in rostrum rectum obtusiusculum attenuata, ±18 mm. longa. *Legumen* polyspermum, rufo-villosum, ±4 cm. longum, 1·7 cm. latum, inflatum, oblongum, stipite 1–2 mm. longo suffultum.

ERITREA : *Schweinfurth* No. 1098 ! (1892) Hb. Schweinf. ; Hamasen, *Pappi* No. 112 ! Hb. Roma.

SUDAN : White Nile, *Von Harnier*, Hb. Kew.

BRITISH EAST AFRICA : North of Mombassa to Lamu and Witu, *Whyte* ! Hb. Mus. Brit. ; Makindu, *Kässner* No. 545 ! Hb. Mus. Brit. ; Kibwesi, *Scheffler* No. 441 ! Hb. Kew.

GERMAN EAST AFRICA : East Uluguru, *Stuhlmann* No. 8722 ! ; Usambara, *Holst* No. 8857 ! Hb. Berol. ; Ugueno Hills, *Volkens* No. 525 ! Marangu, *Volkens* No. 547 ! Hb. Kew.

The colour of the flowers is violet-blue.

Subsp. C. WINKLERI, *Bak. fil. in Fedde, Rep. Sp. Nov.* x. 125 (1911), pro sp.

Caules plures, flexuosi, ex eadem radice orti, 15–30 cm. longis, pilis albidis plus minus vestiti. *Stipulæ* angustæ. *Folia* trifoliolata, petiolata, foliolis minoribus ovatis vel ellipticis 5–16 mm. longis 4–9 mm. latis, pilis albidis vestitis, petiolo communi 5–16 mm. longo suffulta. *Flores* mediocres, in racemos paucifloros laxos dispositi. *Bracteolæ* conspicuæ, lanceolatæ, ad apicem pedicellorum positæ, 3–4 mm. longæ, pilis albidis vestitæ. *Calyx* extus pilosus ; tubus circ. 5 mm. longus ; laciniæ lanceolatæ. *Vexillum* orbiculari-obovatum, luteum, calyce longius, circ. 13–15 mm. longum. *Alæ* oblongæ. *Carina* dorso rotundata, apice in rostrum sensim attenuata, cum unguibus circ. 15 mm. longa. *Ovarium* lineare.

GERMAN EAST AFRICA : Succulent steppe between Makanja and Same, *Dr. H. Winkler* No. 3795 ! Hb. Breslau.

Subsp. C. STEWARTII, *Baker in Oliver, l. c.* ii. 32 (1871), pro sp.

Annua, erecta, parce ramosa, 6–10 dm. alta, pube brevi griseo induta. *Rami* subvalidi. *Stipulæ* setaceæ, persistentes, 8–12 mm. longæ. *Folia*

trifoliolata, foliolis oblongis vel ovato-lanceolatis apice cuspidatis 5–7 cm. longis 20–25 mm. latis, petiolo communi 35–45 mm. longo suffulta. *Flores* mediocres, in racemos laxos 3–12-floros dispositi. *Bracteolæ* 2, ad basin calycis conspicuæ. *Calyx* 12–14 mm. longus, usque ad $\frac{3}{4}$ fissus, pilis longis ferrugineis patentibus indutus ; laciniæ lanceolatæ. *Vexillum* longiusculum, dorso leviter sericeum. *Carina* apice in rostrum attenuata. *Legumen* sessile, oblongum, brunneo-sericeum, 45–50 mm. longum, turgidum.

PORTUGUESE EAST AFRICA : Zambesiland, *Dr. Stewart* ! Hb. Kew.

RHODESIA : Boruma, *Menyharth* No. 1021 ! Hb. Schinz.

Subsp. C. GRANTII, *Baker in Oliver, Fl. Trop. Afr.* ii. 32 (1871) ; *Oliver in Trans. Linn. Soc.* xxix. (1872) 52, tab. 26 B, pro sp.

Suffrutex erectus, divaricato-ramosus, pube brevi griseo patente indutus. *Stipulæ* setaceæ, 4–6 mm. longæ. *Folia* trifoliolata, foliolis obovatis 35–42 mm. longis 20–22 mm. latis superne glabris subtus sericeis, petiolo communi 25–42 mm. longo suffulta. *Racemi* laterales et terminales, 6–13-flori. *Bracteolæ* conspicuæ. *Pedicelli* fructiferi, 5–8 mm. longi. *Calyx* fructiferus in toto circ. 17–18 mm. longus ; lobi lanceolatæ. *Corolla* calyce distincte longior. *Vexillum* dorso brunneo-sericeum. *Carina* calycem superans, marginibus utrinque coalitis. *Legumen* magnum, oblongum, 36–50 mm. longum, 30–40-spermum, pilis longis et patentibus tectum.

SUDAN : Right bank of the Nile in 5° N. lat. as *C. incana*, Linn., *Speke & Grant* ! Hb. Kew. ; Sudan, *H. M. & A. F. Broun* No. 1417 ! Hb. Kew.

134. C. BURKEANA, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 593 ; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 43.

Herbacea vel suffruticosa, erecta, rufo-pilosa vel rufo-hispida. *Stipulæ* lineari-subulatæ vel lanceolatæ vel subfalcatæ. *Folia* 3–5-foliolata, foliolis lineari-lanceolatis vel oblongis sæpe 25–30 mm. longis 3–6 mm. latis, petiolo communi 12–25 mm. longo suffulta. *Flores* majusculi, in racemos laxiusculos 10–15-floros dispositi. *Bracteæ* lanceolatæ. *Bracteolæ* conspicuæ. *Calyx* totus 15–17 mm. longus, lobis lanceolatis. *Vexillum* venosum, apice mucronatum, carina longius. *Carina* flava, circ. 18 mm. longa, dorso genuflexa, vexillo brevior. *Legumen* inflatum, pilosum, oblongum, 40–45 mm. longum, subsessile.

TRANSVAAL : Pietersberg, *Schlechter* No. 4356 ! Hb. Turic., etc. ; Boschveld, *Rehmann* No. 5177 ! Hb. Schinz ; Makapansberg, *Rehmann* No. 5534 ! Hb. Schinz ; Magaliesberg and Aapjes River, *Burke & Zeyher* ! Transvaal, Lin Kana, *Dr. Holub* ! Hb. Turic.; Komati Poort, *Schlechter* No. 11852 ! Hb. Turic. ; near Potchefstroom, *McLea* No. 5634 ! Hb. Mus. Brit.

Var. SPARSIPILA, *Harvey, l. c.*

Planta pilis sparsim obtecta.

ZULULAND : *Miss Owen.*

Series 4. Flores majusculi, in racemos breves dispositi. Carina dorso rotundata, 13–22 mm. longa. Stipulæ parvæ. Legumina sessilia, oblongo-ovoidea, densissime ferruginea vel fusco-pilosa. Frutices erecti vel suffrutices.

135. C. LACHNOCARPOIDES, *Engl. in Hochgebirgsflora,* 246 (1892) ; *Harms in Ann. Ist. Bot. Roma,* vii. (1897) 88.

Planta e basi ramosa. *Caules* circ. 3–4 dm. longi, ubique densissime ferrugineo-pilosi. *Stipulæ* angustæ. *Folia* breviter petiolata vel superiora sessilia, foliolis lanceolatis vel lineari-oblongis basi cuneatim angustatis 3–6 cm. longis 1–1·5 cm. latis, petiolo communi circ. 5 mm. longo prædita. *Racemi* breves, densiflori. *Pedicelli* circ. 2 mm. longi. *Bracteæ* lineari-lanceolatæ, pedicellum æquantes. *Calycis tubus* circ. 5 mm. longus, dentibus elongato-triangularibus. *Vexillum* circ. 15 mm. longum, unguiculatum. *Alæ* circ. 15 mm. longæ et 5 mm. latæ. *Carina* apice inflexa, 13–18 mm. longa. *Legumen* oblongo-ovoideum, circ. 3 cm. longum et 1·5 cm. crassum, densissime ferrugineo-pilosum.

ABYSSINIA : Tigré, alt. 2200 m., *Schimper* ! Hb. Mus. Brit.

GALLA TERRITORY : Burgi, *Riva* No. 1338 ! Hb. Zurich.

GERMAN EAST AFRICA : Usambara, Kwa Msturza, *Holst* No. 8999 ! Hb. Berol., Hb. Kew. ; Usambara, *Buchwald* No. 77 ! Hb. Berol.

Subsp. C. VALIDA, *Baker in Kew. Bull.* (1897) 253, pro sp.

Frutex erectus. *Rami* lignosi. *Folia* breviter petiolata. *Legumina* sessilia, dura, oblonga, oligosperma, nempe quam in typo seminibus paucioribus, et leguminibus brevioribus, sæpius 18–20 mm. longa.

NYASALAND : Between Kondowe and Karonga, *Whyte* No. 373 ! Hb. Kew. ; Shire Highlands, *Buchanan*, 322 ! (1881), *G. Adamson* No. 280 ! Hb. Kew. ; Nyasaland, *Buchanan* No. 204 ! (1895), Kyimbila, *Stolz* No. 233 ! Hb. Mus. Brit.

CONGO REGION : Kundelungu, *Kässner* No. 2573 *a* ! Hb. Mus. Brit.

136. C. LACHNOSEMA, *Stapf in Kew Bull.* (1910) 329.

C. lachnocarpa, Baker in Oliver, Fl. Trop. Afr. ii. 33, quoad Pl. Barter.

Suffruticosa ad 2 m. alt. attingens. *Caulis* erectus, cinereo- vel fulvo-tomentosus. *Stipulæ* lineares, 3–5 mm. longæ. *Folia* trifoliolata, foliolis intermediis oblongis vel oblongo-oblanceolatis 50–60 mm. longis 25–32 mm. latis, foliolis lateralibus inæquilateralibus 35–40 mm. longis, omnibus subtus cinereo-tomentosis, petiolo communi tomentoso 8–12 mm. longo prædita. *Flores* majusculi, in racemos laxissimos pauciflores dispositi. *Bracteolæ* filiformes. *Calyx* cinereo- vel fulvo-tomentosus, 12–18 mm. longus, laciniis lanceolatis. *Vexillum* externe tomentosum, cum ungue circ. 24 mm. longum. *Alæ* oblongæ, circ. 21 mm. longæ et 7–8 mm. latæ. *Carina* fulvo-tomentoso,

dorso rotundata, cum unguibus 20–22 mm. longa. *Ovarium* oblongum, hirsutum. *Legumen* cylindricum, obtusum, circ. 25 mm. longum, dense ferrugineo-tomentosum.

LIBERIA : Kakatown, *Whyte* ! Hb. Kew.

TOGO : *Schroeder* No. 81 ! Hb. Berol.

NIGERIA : Nupe, *Barter* No. 920 ! Hb. Kew.

CAMEROONS : Duka, *Ledermann* No. 3627 ! Hb. Berol.

Series 5. Flores majusculi, in racemos laxiusculos dispositi. Carina dorso rotundata, apice acuta, in toto 20–22 mm. longa. Stipulæ subnullæ. Ovarium lineari-oblongum, stipitatum. Frutex.

137. C. TABULARIS, *Bak. fil.*, sp. nov.

Frutex 1·5–2 m. altus, ramosus, ramulis teretibus puberulis. *Folia* trifoliolata, foliolis oblongo-obovatis vel cuneato-obovatis 40–70 mm. longis 20–33 mm. latis petiolulatis subtus pilis brevibus conspersis, petiolo communi 30–60 mm. longo suffulta. *Flores* majusculi, in racemos dispositi. *Bracteæ* angustæ. *Pedicelli* bibracteolati. *Calyx* extus pubescens; tubus circ. 5 mm. longus, dentibus lanceolatis circ. 6 mm. longis. *Vexillum* calyce 2-plo longius, supra unguem bicallosum. *Alæ* oblongæ. *Carina* subfalcata. *Ovarium* pubescens, lineari-oblongum, stipitatum.

NYASALAND : Nyika Plateau, *A. Whyte* ! Hb. Kew., alt. 2000–2300 metres.

A shrub allied to *C. striata*, DC., with racemes of rather large flowers, and bibracteolate pedicels, and a carina rounded on the back, 20–22 mm. long.

Series 6. Flores majusculi in racemos laxos et plurifloros dispositi. Carina dorso angulo recto curvata inde in rostrum rectum sensim attenuata. Legumen stipitatum, oblongum vel oblongo-oviforme. Fruticosus.

138. C. MACROCARPA, *E. Meyer, Comm.* 24 (1835) ; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 45.

Fruticosus. Stipulæ minutæ. *Folia* trifoliolata, foliolis obovatis 15–30 mm. longis 9–15 mm. latis superne glabris subtus minute pubescentibus, petiolo communi 20–45 mm. longo suffulta. *Flores* mediocres vel majusculi, in racemos laxos plurifloros dispositi. *Bracteæ* angustæ. *Calycis segmenta* lanceolata tubo triplo longiora. *Vexillum* apice mucronatum. *Alæ* carina breviores. *Carina* 14–20 mm. longa, apice in rostrum attenuata. *Legumen* magnum, oblongum, 5–9 cm. longum, glabrum vel pubescens, stipitatum, stipite quam calyce longiore.

NATAL : *Gerrard* No. 1723 ! Hb. Kew. ; Coast Land, *Dr. Sutherland* ! Hb. Kew. ; Distr. Alexandra, *Rudatis* No. 256 ! Hb. Kew. ; Friedenau, *Rudatis* ! Hb. Berol.

KAFFRARIA : Marshy lands between the Omcomas and the Omblas, *Drege* ! Hb. Kew.

TRANSVAAL : Houtbosh, *Rehmann* No. 6257 ! Hb. Schinz ; *Schlechter* No. 4763 ! Boschveld, *Rehmann* No. 5033 ! Hb. Turic. ; Pinaars River Berg, *Schlechter* No. 4210 ! between Shilouvane and Spelunka, Klein Letaba River, *Junod* No. 1527 ! Hb. Schinz ; near Colenso, *Schlechter* No. 6893 ! Hb. Turic.

Series 7. Flores majusculi, in racemos plurifloros laterales dispositi. Carina falcata, 16–19 mm. longa. Stipulæ parvæ, deciduæ. Legumen oblongo-oviforme, ad basin in stipitem attenuatum. Suffrutex.

139. C. ÇOMANESTIANA, *Schweinf. & Volkens, List de Pl. recolt. par Pr. Ghika Çomanesti*, 5 (1897).

Ramosus. Rami incano-pubescentes. *Folia* trifoliolata, foliolis ovatis vel suborbiculari-obovatis basi cuneatis 40–55 mm. longis 23–35 mm. latis, junioribus pubescentibus, petiolo communi 50–60 mm. longo prædita. *Racemi* laterales, 6–10 cm. longi, pluriflori. *Bracteæ* lineares. *Calyx* totus 9–10 mm. longus, dentibus acutis. *Vexillum* striatum, 16–20 mm. longum, calyce subduplo longius. *Alæ* oblongæ, carina breviores. *Carina* calyce subduplo longior. *Legumen* multispermum, oblongo-oviforme, in toto circ. 35 mm. longum, pubescens.

SOMALILAND : Near River Duri and the Burka region, *Pr. Ghika Çomanesti* ! Hb. Berol. ; Lower Sheikh, *Major Thomson* (flowers only) No. 33 ! Hb. Kew. ; Adda Gallah, *James & Thrupp* ! Hb. Kew. ; Arussi and Boran Country, Dereilsh, *Drake-Brockman* No. 96 ! Hb. Kew.

A suffrutex with ovate or obovate leaflets, and rather large flowers. Pod oviform or oblong-oviform, shortly stipitate.

Series 8. Flores majusculi, lutei, in racemos laxos dispositi. Carina dorso rotundata, 16–20 mm. longa. Stipulæ parvæ. Legumen magnum, oblongo-clavatum, breviter stipitatum, glabrum. Frutex erectus.

140. C. MILDBRAEDII, *Bak. fil. in Deutsche Zentral Afr. Exp.* Band ii. 246 (1911).

Erectus, ramosus, sec cl. detectorem 1·5–2·0 m. alt. attingens. *Stipulæ* setaceæ, ±4 mm. longæ. *Folia* trifoliolata, foliolis oblongis vel ellipticis basi cuneatis 25–50 mm. longis 7–20 mm. latis subtus strigoso-pubescentibus, petiolo communi pubescente 20–35 mm. longo suffulta. *Flores* aurei vel aurantiaci, mediocres vel majusculi. *Bracteæ* angustæ, 3–4 mm. longæ. *Bracteolæ* parvæ, ad apicem pedicelli insertæ. *Pedicelli* floriferi 7–9 mm. longi, fructiferi 12–16 mm. longi. *Calyx* totus circ. 8·5 mm. longus ; tubus

circ. 5 mm. longus ; lobi 3·5 mm. longi. *Vexillum* circ. 16–17 mm. longum, flavum. *Alæ* oblongæ. *Carina* flava, dorso rotundata, 16–20 mm. longa. *Legumen* inflatum, multispermum, 5–5·5 cm. longum, 16–18 mm. latum, oblongo-clavatum, stipitatum, extus glabrum, stipite 6–8 mm. longo suffultum.

German East Africa : Kissenye, Ninagongo, *Mildbraed* No. 1301; N. O. Kiwa, *J. Mildbraed* No. 6518, Hb. Berol. ; " Busch and Kraut Steppe " on Lake Kalago south-east of Karisimbi at an altidude of 2300 metres.

Series 9. Flores majusculi, in racemos laxos breves dispositi. Carina dorso rotundata, 16–21 mm. longa. Stipulæ lineares. Bracteolæ 2, conspicuæ, apicem versus pedicelli positæ. Ovarium stipitatum. Legumen deest. Perennis vel suffruticosa.

141. C. Prittwitzii, *Bak. fil.*, sp. nov.

Caules herbacei, elongati, ramosi. *Stipulæ* lineares, circ. 2 mm. longæ. *Folia* trifoliolata, foliolis anguste oblongis apice mucronulatis 15–30 mm. longis 40–80 mm. latis, petiolo 10–23 mm. longo suffulta. *Flores* majusculi, in racemos laxos dispositi. *Pedicelli* 4–10 mm. longi. *Bracteæ* angustæ, lineares 5–7 mm. longæ. *Bracteolæ* 2, ±5 mm. longæ, lineares, conspicuæ. *Calyx* totus 7–8 mm. longus, dentibus triangularibus acutis circ. 5 mm. longis. *Vexillum* 18–19 mm. longum, suborbiculari-obovatum. *Alæ* ovato-oblongæ, carina paullo longiores. *Carina* dorso rotundata, circ. 16–21 mm. longa. *Ovarium* stipitatum, pubescens. *Legumen* deest.

German East Africa : Kilimatinde, *Von Prittwitz* No. 116 ! alt. 1300 m., Hb. Berol. In flower, 2 Feb. 1904.

The distinguishing features of this plant are :—The long branching herbaceous stems, the small stipules, the narrow leaflets, the very lax raceme of rather large flowers, the conspicuons bracteoles about 5 mm. long, the stipitate, pubescent ovary.

Series 10. Flores majusculi, in racemos laxos 10–20-floros dispositi. Carina dorso angulo recto curvata inde in rostrum longum et rectum attenuata, in toto 15–20 mm. longa. Legumen sessile, oblongo-oviforme.

142. C. Macaulayæ, *Bak. fil.*, sp nov.

Erectus ramosus, virgatus, longitudinaliter striatus, 40–50 cm. altus vel ultra. *Stipulæ* parvæ, lineares. *Folia* trifoliolata, foliolis viridibus cuneato-oblongis intermediis paullo majoribus 30–55 mm. longis 10–12 mm. latis, petiolo communi 10–20 mm. longo instructa. *Flores* majusculi, pulcherrimi, laxe racemosi. *Pedicelli* bracteolati, post anthesin nutantes. *Bracteæ* lineares, pedicello breviores. *Calyx* 7–9 mm. longus, lobis triangularibus acutis. *Vexillum* luteum, sæpe 22–28 mm. longum. *Alæ* vexillo breviores. *Carina*

15–20 mm. longa; rostrum rectum, gracile. *Legumen* sessile, oblongo oviforme, circ. 20 mm. longum.

NORTH RHODESIA: Near Mumbwa, *Mrs. Macaulay* No. 758! Hb. Kew.

A showy plant allied to *C. spartioides*, DC., in the Simplicifoliæ, but the leaves are all trifoliolate, the flowers are large, and the carina is 15–20 mm. long and bent at a right angle.

Series 11. Flores mediocres vel majusculi, in racemos laxos et sæpius elongatos et multifloros dispositi. Carina dorso genuflexa, vel rotundata. Vexillum eleganter lineolatum. Stipulæ minutæ vel 0. Legumina sessilia vel brevissime stipitata, oblonga vel oblongo-cylindrica. Herbæ erectæ, oligophyllæ vel suffrutices.

143. C. OCHROLEUCA, *G. Don, Gen. Syst.* ii. 138 (1832); *Hook. fil. et Benth. Fl. Nig.* 291.

Caulis erectus, ramosus, oligophyllus. *Stipulæ* obsoletæ. *Folia* trifoliolata, lineari-lanceolatis acuminatis 40–95 mm. longis 5–11 mm. latis subtus pilis obtectis, petiolo communi circ. 20–37 mm. longo instructa. *Racemus* terminalis, pauciflorus. *Calyx* campanulatus, dentibus brevibus. *Vexillum* carina paullo brevius, apice mucronatum. *Alæ* apice obtusæ, carina breviores. *Carina* dorso genuflexa, apice in rostrum acutum et patens attenuata, circ. 15–17 mm. longum. *Legumen* oblongo-cylindricum, 28–30 mm. longum.

ST. THOMAS: *Don*! Hb. Mus. Brit.

Don states this is a shrubby, erect plant, with cream-coloured flowers.

144. C. INTERMEDIA, *Kotschy in Sitzungsb. Akad. Wien* (1864) 362, t. 3; *Baker in Oliver, Fl. Trop. Afr.* ii. 37; *Hiern, Cat. Welw. Afr. Pl.* i. 203.

C. lanceolata, Th. & H. Durand, Sylloge Fl. Congo, 124, pro parte.

Annua vel perennis ad *C. ochroleucam*, Don, valde accedens. *Caulis* elatus, oligophyllus, sparse ramosus. *Rami* subglabri, teretes. *Stipulæ* 0. *Folia* trifoliolata, angusta, foliolis supra glabris 15–60 mm. longis 5–12 mm. latis, petiolo communi 10–30 mm. longo suffulta. *Flores* mediocres vel majusculi, in racemos sæpius elongatos et laxos dispositi. *Bracteæ* angustæ, parvæ. *Bracteolæ* angustæ. *Calyx* adpresse pilosus; laciniæ lanceolato-subulatæ. *Vexillum* ovatum vel ovale, apice acutum, eleganter lineolatum, 16–20 mm. longum. *Carina* dorso genuflexa, apice in rostrum acutum et patens attenuata, sub lente ad marginem pube tenuissima ornata. *Legumen* polyspermum, oblongo-cylindricum vel cylindricum, 30–45 mm. longum.

SIERRA LEONE: Boundary Commission, Layah, *Scott Elliot* No. 4483! Hb. Mus. Brit.

LIBERIA: *Whyte*! Hb. Kew.

LAGOS: *Millen*! Hb. Kew.

NIGERIA: Sokoto Prov., *Dalziel* No. 339! Hb. Kew.

French Equatorial Africa: Korbo, *Chevalier*! Hb. Mus. Paris; Chari Central, *Chevalier* No. 8954! Hb. Mus. Paris.

Djurland: Seriba Ghattas, *Schweinfurth* No. 2320! Hb. Kew.

British East Africa: Elgon District, *Sir Evan James*! Hb. Kew.

Uganda: Gondokoro, *Knoblechler* No. 90! Unjoro, *Speke & Grant*! Buddu, *Dawe* No. 123! Hb. Kew.

Congo Region: *Dewèvre* No. 601! Hb. Brux.; *Cabra* No. 30! Hb. Brux.

Angola: Golungo Alto, *Welwitsch* Nos. 1956! 1985! Hb. Mus. Brit.; Pungo Andongo, *Mechow* No. 106! Hb. Turic.; Angola, *Monteiro*! Hb. Kew.; Kutsi and Kuhi, *Baum* No. 876! Hb. Berol., etc.

German East Africa: Kilimanjaro, *Volkens* No. 6526! Hb. Berol.; Msilala, *Hannington*! Hb. Kew.; Ugueno, *Volkens* No. 526! Hb. Berol.; Tabora, *Stuhlmann* No. 580! Hb. Schweinf.

Nyasaland: Lower Plateau, Lake Nyasa, *Thomson*! Hb. Kew.

Rhodesia: Mazoe, *F. Eyles* No. 274! Hb. Mus. Brit.

Var. nov. PARVIFLORA, *Bak. fil.*

Suffrutex erectus, ramosus, pubescens. *Stipulæ* subnullæ. *Foliola* oblonga vel lineari-oblonga. *Flores* quam in typo minores. *Calyx* extus pubescens, tubo oblique campanulato circ. 2·5 mm. longo, dentibus circ. 1·5 mm. longis. *Vexillum* luteum, lineis purpureis percursum, 11–12 mm. longum, circ. 10 mm. latum. *Carina* dorso genuflexa, in sicco lutea, circ. 13 mm. longa. *Legumen* subsessile, cylindricum, 20–25 mm. longum.

British East Africa: Kitui in Ukamba, *Hildebrandt* No. 2802! Hb. Berol., etc.; Mombasa, English Point, *Thomas* No. 22! Hb. Berol.

Var. ABYSSINICA, *Taubert ex Engl. in Abhandl. Preuss. Akad. Wiss.* 1891 (1892) 247.

Erectus. Folia trifoliolata, foliolis ellipticis vel oblongo-ellipticis 50–65 mm. longis 15–26 mm. latis, petiolo communi 20–26 mm. longo prædita. *Flores* majusculi, in racemos elongatos dispositi. *Carina* cymbæformis, circ. 20 mm. longa. *Legumen* subcylindricum, apicem versus leviter curvatum.

Abyssinia: Ifak, *Schimper* (1863–68) No. 1526! Hb. Mus. Brit., etc.

This plant is sometimes found in herbaria named *C. tigrensis*, Baker, but it differs from this species in many points.

Forma nov. LATIFOLIA, *Bak. fil.*

Foliola majora, 9–14 cm. longa, 3–4·5 cm. lata.

Togoland: *Kersting* No. A 494! Hb. Berol.

Forma SERICOCALYX, *Taubert in Herb. Berol.* pro var.

Calyx sericeo-hirtus. *Carina* 15–17 mm. longa.

EAST AFRICA : *Fischer* No. 227 ! Hb. Berol.

GERMAN EAST AFRICA : Mpororo, *Stuhlmann* No. 2085 ! Hb. Schweinf.

NYASALAND : S.W. Nyasa, Utundue, *Stuhlmann* No. 3475 ! Hb. Schweinf.

145. C. BREVIDENS, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 585 ; *Baker in Oliver, Fl. Trop. Afr.* ii. 37.

Herbacea, erecta, striata, fere glabra. *Stipulæ* minutæ vel 0. *Folia* trifoliolata, foliolis linearibus superne glabris intermediis 50–80 mm. longis 7–9 mm. latis, petiolo communi circ. 6–17 mm. longo prædita. *Flores* mediocres, in racemos paucifloros dispositi. *Bracteæ* lineares, minutæ, pedicellis 3–4 mm. longis. *Calycis tubus* oblique campanulatus, glaber, in toto circ. 4–4·5 mm. longus, dentibus brevibus. *Vexillum* suborbiculari-obovatum, 16–18 mm. longum. *Carina* dorso genuflexa, circ. 20 mm. longa. *Legumen* sessile, cylindricum, circ. 45 mm. longum, polyspermum.

SUDAN : Nubia, Kingdom of Fazokal, *Kotschy* No. 424 ! Hb. Kew.

The racemes are few-flowered, and the calyx-teeth are very short.

146. C. CANNABINA, *Schweinf. MS. in Herb. Berol.*

C. intermedia, Schweinf. Fl. Gallabat, *non* Kotschy.

Caulis erectus, sulcatus, elatus, deorsum glabriusculus, sursum pubescens. *Stipulæ* subnullæ. *Folia* trifoliolata, foliolis membranaceis oblongis vel oblongo-ellipticis basi cuneatis apice mucronatis 50–110 mm. longis 10–33 mm. latis supra glabris vel glabriusculis subtus griseo-viridibus, petiolo communi 20–35 mm. longo prædita. *Flores* majusculi in racemos multifloros dispositi. *Bracteæ bracteolæque* lineares. *Calyx* totus 5–7 mm. longus. *Vexillum* in sicco luteum, ± 20 mm. longum. *Alæ* carina breviores. *Carina* naviculariformis, apice in rostrum attenuata, circ. 20 mm. longa. *Legumen* oblongo-cylindricum, 40–55 mm. longum, 13–20 mm. latum, demum glabrum.

ABYSSINIA : Gallabat, *Schweinfurth* No. 1880 ! Hb. Mus. Brit., etc.

DJURLAND : *Schweinfurth* No. 2435 ! Hb. Kew. No. 2495 ! Hb. Schweinf.

BONGOLAND : *Schweinfurth* No. 2751 ! Hb. Kew.

NIAMNIAMLAND : *Schweinfurth* No. 3087 ! Hb. Schweinf.

Ledermann No. 5369 is perhaps a form. Erect, 1·0–1·8 met. tall. Flowers golden. Standard with wine-red lines.

147. C. PURPUREO-LINEATA, *Bak. fil.*, sp. nov.

Suffrutex erectus, robustus, virgatus, striatus, sec. cl. detectorem 0·6–1·5 met. alt. *Stipulæ* subnullæ. *Folia* trifoliolata, foliolis oblongo-ellipticis vel oblanceolatis vel oblanceolato-ellipticis 15–55 mm. longis 6–16 mm. latis subtus pubescentibus, petiolo communi pubescente 10–25 mm. longo prædita. *Flores* majusculi, in racemum terminale elongatum dispositi. *Bracteæ bracteo-*

læque parvæ, bracteolis ad basin calycis adnatis. *Pedicelli* 2–4 mm. longi. *Calyx* extus pubescens, totus 6–9 mm. longus, dentibus acutis 4–4·5 mm. longis. *Vexillum* in sicco flavum, insigniter et eleganter brunneo-striatum, circ. 19 mm. longum. *Alæ* oblongæ, flavæ, circ. 18 mm. longæ. *Carina* dorso rotundata, in toto circ. 20 mm. longa lineis atro-purpureis notata, falcata vel subfalcata, ungue circ. 5–6 mm. longo instructa. *Ovarium* lineare distincte stipitatum. *Legumen* deest.

British East Africa: Mau Escarpment, *Guy Baker* No. 120! Hb. Berol. Common in Mau Grassland and edges of forest. Escarpment, *F. Thomas* No. 73! Hb. Berol. In flower 11 Feb. 1902.

Allied to *C. cannabina*, Schweinf., from which it differs in the much larger wings. The racemes often reach 35 cm. in length; the carina is about 20 mm. long, with dark purple lines.

Subsect. 2. MEDIOCRIFLORÆ.

Stipulæ parvæ vel angustæ vel obsoletæ. Flores mediocres, sæpius in racemos dispositi. Carina sæpius 11–15 mm. vel rarissime 18 mm. longa.

(*C. Schumanniana*, cf. pp. 315, 350; *C. lanceolata*, cf. p. 343.)

Clavis specierum.

1.	Carina dorso angulo recto curvata inde in rostrum longum vel longiusculum attenuata	2
	Carina dorso rotundata, sæpe falcata vel subfalcata	15
2.	Racemi densi, multiflori	3
	Racemi laxi, pauciflori	4
	Racemi laxi, pluriflori	9
	Racemi laxi, multiflori, elongati	12
3.	Legumen oblongum, angulatum, 11–14 mm. longum	*bagamoyoensis.*
	Legumen oblongum, cum stipite 20–23 mm. longum	*ivantulensis.*
4.	Carina 7–9 mm. longa	*Grantiana.*
	Carina 9–15 mm. longa	5
5.	Species intertropicales	6
	Species austro-occidentales	7
	Species austro-orientales	8
6.	Foliola oblanceolata	*Forbesii.*
	Foliola oblanceolata vel oblongo-obovata	*cæspitosa.*
7.	Foliola oblonga. Planta hereroensis	*Kurtii.*
	Foliola angustissima. Vexillum carina brevius. Planta amboensis	*paucifolia.*
	Foliola angustissima. Vexillum carina longius. Planta namaquensis	*Heidmannii.*
8.	Foliola oblongo-linearia vel lanceolata	*distans.*
9.	Carina 7–9 mm. longa	10
	Carina 9–15 mm. longa	11

10. Foliola cuneato-obovata vel cuneato-oblonga. Planta intertropicalis .... *senegalensis.*
Foliola cuneato-oblonga vel cuneato-elliptica. Planta delagoensis .... *Junodiana.*
11 (*a*) Foliola oblonga. Calyx pilosus .... *oocarpa.*
(*b*) Foliola elliptica, lateralia conspicue minora. Calyx pubescens .. *laburnoides.*
(*c*) Foliola cuneato-obovata. Planta namaquensis .... *Pearsonii.*
(*d*) Foliola terminalia oblongo-cuneata, lateralia cuneato-obovata .. *virgulata.*
(*e*) Foliola oblonga vel lanceolato-oblonga. Planta rhodesiana .... *flavicarinata.*
12. Calycis lobi lati, abrupte in cuspidem attenuata .... *platysepala.*
Calycis lobi lanceolati vel triangulares 13
13. Vexillum lineis purpureis eleganter notatum .... *vogelioides.*
Vexillum luteum vel aureum 14
14. Foliola oblongo-ovata vel obovata. Species intertropicalis .... *africana.*
Foliola cuneato-oblonga. Species intertropicalis .... *maxillaris.*
Foliola lineari-oblonga. Species hereroensis .... *aurea.*
15. Racemi laxi, pauciflori 16
Racemi laxi, pluriflori 21
Racemi laxi, multiflori 27
Racemi densi, breves. Carina in sicco purpurea .... *albicaulis.*
Racemi densi vel densiusculi, mediocres 32
Flores apicem versus pedunculorum 2–5 aggregati .... *obscura.*
16 (*a*) Cinerea vel fusco-tomentosa. Foliola obovata vel elliptica. Carina 15 mm. longa .... *griseofusca.*
(*b*) Molliter hirta. Foliola obovata. Carina 10–12 mm. longa .. *mollis.*
(*c*) Glabræ vel pubescentes, rarius sursum tomentosæ 17
17. Species natalensis. Foliola elliptica vel ovata .... *natalensis.*
Species austro-occidentalis et centralis 18
Species intertropicales 19
19. Species occidentales 20
Species abyssinica. Carina falcata, 13–15 mm. longa .... *pallida.*
18. Foliola oblongo-lanceolata. Carina 10–11 mm. longa .... *Barnabassii.*
20. Foliola herbacea, ovata vel elliptica. Carina 10–12 mm. longa. *Doniana.*
Foliola coriacea, oblonga vel elliptica. Carina 11–14 mm. longa. *amœna.*
Foliola ovata vel oblonga. Carina 7–9 mm. longa .... *cyanea.*
21. Calyx sæpius 14–16 mm. longus .... *mauensis.*
Calyx brevior 22
22. Sericeæ vel sericeo-hirtæ vel pilis longis obtectæ 23
Glabræ vel pubescentes 26
23. Species austro-occidentales 24
Species intertropicales 25
24. Sericea. Legumen 18–25 mm. longum. Planta hereroensis .. *colorata.*
Sericeo-hirta. Legumen 25–30 mm. longa. Planta namaquensis *erecta.*
25. Legumen sæpius 25–35 mm. longum .... *incana.*
Legumen circ. 15 mm. longum .... *emarginella.*
26 (*a*) Foliola oblonga vel oblongo-lanceolata. Racemi 12–18-flori .. *Lotononis.*
(*b*) Foliola obovata vel oblongo-obovata. Racemi 3–12-flori. Vexillum extus cupreo-rubrum .... *versicolor.*
(*c*) Foliola obovata. Racemi 9–20-flori. Vexillum extus cinnamomeum .... *glaucifolia.*

(*d*)	Foliola obovata vel elliptica. Vexillum extus luteum. Carina 11–14 mm. longa	*argyræa.*
(*e*)	Foliola cuneato-obovata. Vexillum extus lineis brunneis notatum. Carina 10–12 mm. longa	*Pearsonii.*
(*f*)	Foliola anguste oblonga. Carina 10–11 mm. longa lineis purpureis notatum	*cleomoides.*
27.	Flores saturate rosei. Species australis	*purpurea.*
	Flores lutei vel flavi vel cœrulei, interdum lineati.	28
28.	Foliola 3	29
	Foliola 5, rarius 3. Carina 11–15 mm. longa	*cleomifolia.*
29.	Carina 10–12 mm. longa	30
	Carina 13–15 vel rarius 16 mm. longa	31
30 (*a*)	Foliola elliptica vel ovata. Herbacea	*Nicholsonii.*
(*b*)	Foliola obovata vel oblongo-obovata. Suffruticosa	*striata.*
(*c*)	Foliola obovata. Fruticosa	*falcata.*
(*d*)	Foliola oblonga vel lanceolata. Herbacea	*Lotononis.*
(*e*)	Foliola obovata vel cuneato-elliptica. Legumen stipitata	*argyræa.*
(*f*)	Foliola linearia vel lineari-lanceolata	*longithyrsa.*
(*g*)	Foliola elliptica vel ovata. Bracteæ 6–10 mm. longæ	*Keilii.*
(*h*)	Foliola elliptica vel anguste elliptica. Bracteæ 3–4 mm. longæ.	*usaramoensis.*
31 (*a*)	Foliola elliptico-oblonga vel oblonga. Flores lutei	*zanzibarica.*
(*b*)	Foliola oblonga vel oblongo-elliptica. Flores striati	*Rogersii.*
(*c*)	Foliola obovata vel oblongo-obovata. Flores striati	*striata.*
(*d*)	Foliola lanceolata. Stipulæ 17–20 mm. longæ	*longifoliolata.*
(*e*)	Foliola lanceolata vel lineari-lanceolata. Stipulæ vix 10 mm. longæ	*recta*, subsp. *simplex.*
(*f*)	Foliola ovata vel obovata. Petioli 1–2 cm. longi	*recta.*
(*g*)	Foliola ovato-oblonga vel elliptico-oblonga. Petioli 4–6 cm. longi	*Muntzneri.*
32.	Procumbens. Griseo-sericea. Carina 12–13 mm. longa	*protensa.*
	Erecta vel suberecta. Carina 10–14 mm. longa	33
33 (*a*)	Canescenti-tomentosa. Foliola ovalia vel suborbiculari-obovata	*Deflersii.*
(*b*)	Ferrugine-tomentosa. Folioli orbiculari-obovata	*trifoliolata.*
(*c*)	Pubescens. Foliola obovata vel elliptico-obovata	*obovata.*
(*d*)	Pilis griseis plus minus vestita. Foliola linearia	*Kirkii.*
(*e*)	Pilis griseis plus minus vestita. Foliola obovata vel obovato-oblonga	*striata.*
(*f*)	Pubescens. Foliola oblonga vel oblongo-elliptica. Carina brevior	*Oreadum.*

Series 12. Flores mediocres, in racemos densos et multifloros dispositi. Carina dorso angulo recto curvata inde in rostrum rectum attenuata, in toto 10–12 mm. longa. Stipulæ parvæ. Legumen oblongum, angulatum, sessile.

148. C. BAGAMOYOENSIS, *Bak. fil.*, sp. nov.

Suffruticosa, erecta, ad *C. globiferam*, E. Mey., accedens. *Folia* trifoliolata, foliolis ellipticis vel elliptico-obovatis 25–50 mm. longis 15–18 mm. latis glauco-viridibus, petiolo communi superne canaliculato 20–30 mm. longo suffulta. *Racemi* 5–12 cm. longi. *Pedicelli* 1–3 mm. longi. *Calyx* extus

hirtus, circ. 5 mm. longus, dentibus lanceolatis acuminatis. *Carina* dorso angulo recto curvata, in toto 10–12 mm. longa. *Legumen* extus cinereo-pubescens, 11–14 mm. longum, 10–12-spermum, subtus fere carinatum, seminibus nigrescentibus reniformibus.

GERMAN EAST AFRICA : Bagamoyo, *Kirk* ! Hb. Kew.

An erect suffrutex allied to *C. globifera*, E. Mey., but with quite different fruit. The pods are of a curious shape, flat on the top and almost keeled below, apiculate.

Series 13. Flores lutei, mediocres, in racemos subdensos et multifloros dispositi. Carina dorso angulo fere recto curvata inde in rostrum rectum attenuata, 13–15 mm. longa. Stipulæ setaceæ. Legumen oblongo-oviforme, breviter stipitatum.

149. C. IVANTULENSIS, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 26 (1871).

Suffrutex erectus, ramosus, 0·6–1·3 m. alt., cinereo-pubescens. *Stipulæ* circ. 3 mm. longæ. *Folia* trifoliolata, foliolis oblongis vel ellipticis, 20–40 mm. longis 10–15 mm. latis, supremis minoribus apice obtusis, superne viridibus et glabris subtus glaucis et leviter griseo-sericeis, petiolo communi 17–34 mm. longo suffulta. *Bracteæ* persistentes, 3–4 mm. longæ. *Bracteolæ* 2, ad apicem pedicelli filiformes, circ. 2 mm. longæ. *Calyx* extus pubescens ; tubus ± 4 mm. longus ; laciniæ lanceolatæ. *Vexillum* circ. 12 mm. longum, obovatum. *Alæ* circ. 12 mm. longæ, unguiculatæ. *Legumen* cum stipite 20–23 mm. longum, extus pubescens.

ANGOLA : Huilla, *Welwitsch* No. 1975 ! Hb. Mus. Brit. ; *Antunes & Dekindt* No. 3171 ! Hb. Mus. Paris.

A suffruticose plant with trifoliolate leaves, with elliptical or oblong leaflets ; the yellow flowers are in a somewhat lax raceme, the pod is oblong stipitate, the two filiform bracteoles at the apex of the pedicels are ± 2 mm. long.

Specimens collected in German East Africa by *Dr. F. Jaeger* No. 411 and by *Dr. G. Volkens* at Saga in Usambara closely approach the above.

Series 14. Flores mediocres, in racemos paucifloros vel multifloros dispositi. Carina dorso angulata, ±15 mm. longa. Stipulæ parvæ. Legumen ellipsoideum, sessile. Suffrutex.

150. C. FLAVICARINATA, *Bak. fil. in Journ. Linn. Soc., Bot.* xxxvii. (1906) 437.

Caulis erectus, suffruticosus, virgatus, striatus. *Folia* trifoliolata, foliolis oblongis vel lanceolato-oblongis 20–40 mm. longis 7–16 mm. latis brevissime petiolulatis subtus strigoso-pubescentibus, petiolo communi 10–18 mm. longo instructa. *Racemi* laxi. *Bracteæ* parvæ. *Flores* pedicellati, pedicellis tenuibus in medio bracteolatis. *Calycis tubus* campanulatus, segmentis lanceolatis acuminatis. *Corolla* calycem excedens. *Vexillum* violaceum,

supra unguem insigniter bicallosum ±15 mm. longum. *Legumen* 15–24 mm. longum.

SOUTH RHODESIA: Islands of Zambesi nr. Victoria Falls, *Miss Gibbs* No. 168! Hb. Mus. Brit.; Rain Forest, Victoria Falls, *C. Allen* No. 31! Hb. Kew.; near Victoria Falls, *F. A. Rogers* No. 5123! Hb. Kew.

A plant from Huilla, *Antunes* No. 140 in Herb. Mus. Paris, is very closely allied.

Series 15. Flores mediocres, in racemos paucifloros et laxissimos dispositi. Carina dorso angulo recto curvata, hinc in rostrum sensim attenuata, in toto 9–12 mm. longa. Stipulæ parvæ. Legumina oviformia vel oblonga, sessilia vel brevissime stipitata. Annuæ foliolis angustis.

151. C. PAUCIFOLIA, *Schinz in Viertelj. Nat. Ges. Zürich*, lii. (1907) 420.

Annua oligophylla, ramosa, strigoso-sericeo-pubescens. *Rami* suberecti vel erecto-patentes. *Stipulæ* parvæ, lineares. *Folia* trifoliolata, foliolis linearibus sericeo-pubescentibus apice acutis inter mediis 15–25–45 mm. longis 2–4 mm. latis, lateralibus minoribus, petiolo communi 10–13 mm. longo suffulta. *Flores* aurei, mediocres, in racemos laxissimos 2–3-floros ispositi. *Bracteæ* lineares, ±1·5 mm. longæ. *Pedicelli* 3–5 mm. longi. *Calyx* 6 mm. longus, strigoso-pubescens; laciniæ anguste lanceolatæ, tubo longiores. *Vexillum* extus pubescens, striatum, apice acutum, carina sæpius brevius. *Alæ* oblongæ, carina conspicue breviores. *Carina* apice in rostrum longum et rectum sensim attenuata, in toto ±12 mm. longa. *Legumen* oblongum, breviter stipitatum, circ. 10 mm. longum, pubescens.—Species ad *C. cernuum*, Schinz, accedens.

AMBOLAND: Namakunde, *Rautanen* No. 553! Hb. Turic.; Namakunde, *Rautanen* No. 24 Hb. Berol.

An annual with narrow leaflets, very lax racemes, and few flowers.

152. C. HEIDMANNII, *Schinz in Mém. Herb. Boiss.* No. 1, 128 (1900).

Annua, e basi ramosa. *Stipulæ* circ. 1 mm. longæ. *Folia* trifoliolata, foliolis linearibus apice acutis 10–20 mm. longis sæpissime 1–2 mm. latis strigoso-pubescentibus, petiolo communi 3–7 mm. longo suffulta. *Flores* mediocres, in racemos laxissimos et paucifloros dispositi. *Pedicelli* circ. 3–4 mm. longi. *Bracteæ* circ. 1 mm. longæ. *Calyx* totus 5–6 mm. longus; laciniæ lanceolatæ. *Vexillum* carina longius, apice mucronatum. *Alæ* carina breviores. *Carina* cymbæformis, circ. 9–11 mm. longa. *Legumina* oviformia, circ. 10 mm. longa, brevissime stipitata.

GREAT NAMAQUALAND: Rehoboth, *Dr. Fleck* No. 448! Hb. Turic.; Gr. Barmen, *Dinter* No. 525! Hb. Turic.

A copiously branched plant, with small stipules, narrow leaves, a lax raceme of few flowers, and egg-shaped pods.

Series 16. Flores mediocres, in racemos laxos dispositi. Carina dorso angulo recto curvata inde in rostrum rectum sensim attenuata, in toto circ. 10–11 mm. longa. Stipulæ parvæ, setaceæ, 2–3 mm. longæ. Legumina oblonga, glabra, sessilia, lateraliter subcompressum.

153. C. CÆSPITOSA, *Baker in Kew Bull.* (1897) 252.

Radix lignosa. *Caules* plures, herbacei, flexuosi, cæspitosi, 15–30 cm. longi ex eadem radice orti, plus minusve angulati, pubescentes. *Folia* trifoliolata, foliolis oblanceolatis obtusis vel oblongo-obovatis basi cuneatis 10–26 mm. longis 5–7 mm. latis viridibus, petiolo communi 2–4 mm. longo instructa. *Flores* pedicellati. *Bracteæ* ad basin pedicelli positæ, angustæ, 3 mm. longæ. *Calyx* totus 5–6 mm. longus; laciniæ lanceolatæ tubo longiores. *Vexillum* calyce longius, suborbiculari-obovatum, dorso glabrum. *Alæ* oblongæ. *Carina* aurantiaca, calyce duplo longior. *Legumen* oligospermum, 10–11 mm. longum, apice mucronatum, durum.

NYASALAND: Mt. Zomba, *Whyte*!; Mt. Malosa, alt. 1300–2000 m., *Whyte*! Hb. Kew.

Easily distinguished by the glabrous, sessile, hard, few-seeded, somewhat laterally compressed pod 10–11 mm. long.

Series 17. Flores mediocres, lutei, in racemos laxos elongatos dispositi. Carina dorso angulo fere recto curvata inde in rostrum rectum attenuata, in toto circ. 14–16 mm. longa. Stipulæ parvæ, setaceæ. Legumen obovato-globosum, stipitatum.

154. C. AUREA, *Dinter MS. in Herb. Berol.*

Herba ramosa, puberula, usque ad 1·5 m. alt. attingens. *Folia* trifoliolata, foliolis lineari-oblongis 25–40 mm. longis 4–8 mm. latis glauco-viridibus subtus strigoso-pubescentibus, petiolo communi 12–20 mm. longo suffulta. *Flores* in racemos 6–18 cm. longos laxe multifloros dispositi. *Racemi* circ. 5–20-flori. *Bracteæ* lineares. *Bracteolæ* ad basin calycis adnatæ, circ. 1·5 mm. longæ. *Calycis tubus* oblique campanulatus, dentibus trianguli-lanceolatis acutis; calyx totus circ. 6 mm. longus. *Vexillum* calyce subtriplo longius, circ. 15–16 mm. longum. *Carina* dorso angulata. *Legumen* inflatum, cum stipite usque ad 15 mm. longum, pubescens, circ. 6-spermum.—Ad *C. argyræam*, Welw., accedens.

HEREROLAND: Okahandja, *Dinter* No. 524! Hbb. Berol., Turic.

Allied also to *C. globifera*, E. Mey. The racemes are long and lax, the flowers yellow, the keel curved at a right angle with a long straight rostrum, the pod 11–12 mm. long, the stipe ±4 mm. long.

Series 18. Flores mediocres, in racemos multifloros elongatos laxos dispositi. Carina dorso angulo recto curvata inde in rostrum rectum curvata attenuata circ. 11 mm. longa. Stipulæ parvæ. Legumina ignota.

155. C. VOGELIOIDES, *Bak. fil.*, sp. nov.

Caulis erectus, striatus, ramosus. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis linearibus, foliolis superioribus solum mihi obviis 15–55 mm. longis 1·5–3·5 mm. latis superne glabris, petiolulis pubescentibus 1·0–1·5 mm. longis, petiolo communi 10–16 mm. longo suffulta. *Flores* mediocres iis *C. Vogelii*, Benth., subsimiles, in racemos elongatos dispositi. *Bracteæ* parvæ. *Bracteolæ* minutæ, apicem versus pedicelli positæ. *Pedicelli* graciles, 3–4 mm. longi. *Calyx* totus 4·5–5·0 mm. longus, dentibus acutis. *Vexillum* in sicco lineis purpureis striatum, 12–14 mm. longum. *Alæ* oblongæ, carinæ subæquilongæ. *Ovarium* lineari-oblongum, circ. 5 mm. longum. *Legumen* deest.

GERMAN EAST AFRICA: Ussukuma, Muansa, *Dr. Stuhlmann* (Expedition Emin Pascha) No. 4675! Hb. Berol.

This plant has very similar flowers to *C. Vogelii*, Benth., in the Simplicifoliæ. The chief characteristics are the erect stem, the very narrow leaflets, the very long, lax racemes 20–30 cm. or more, many-flowered, with pedicels 3–4 mm. long, and the striate corolla.

A closely allied plant, which is 1·0–1·5 m. high, was collected by Dr. Engler at Nakuru, British East Africa, No. 2055. The pod, 40–45 mm. long, is oblong-clavate, glabrous, narrowing at the base into a short stipe.

Series 19. Flores lutei, in racemos laxos nunc breves nunc elongatos dispositi. Carina dorso angulo recto curvata, inde in rostrum rectum et longiusculum attenuata, in toto 7–15 mm. longa. Stipulæ parvæ. Legumina oviformia, breviter stipitata vel sessilia. Herbæ vel suffrutices.

156. C. MAXILLARIS, *Klotzsch in Peters's Mossamb., Bot.* 58 (1862); *Baker in Oliver, Fl. Trop. Afr.* ii. 30.

C. carinata, Steud. in Herb. Schimp. No. 772.

C. karongensis, Baker in Kew Bull. (1897) 252.

Suffruticosa, erecta, sparse ramosa. *Stipulæ* brevissime subulatæ. *Folia* trifoliolata, foliolis cuneato-oblongis 20–30 mm. longis 5–10 mm. latis supra viridibus glabris subtus glaucis pubescentibus, petiolo communi 10–20 mm. longe prædita. *Flores* in racemos 10–30 cm. longos dispositi *Bracteæ* subulatæ. *Calyx* quinquefidus, pubescens, laciniis lanceolatis acutis. *Vexillum* extus pubescens. *Alæ* glabræ. *Carina* glabra 10–13 mm. longa. *Legumen* oblongo-obovatum, puberulum, 5–7-spermum.

NIGERIA: Katagum District, *Dalziel* No. 12! Hb. Kew.

SUDAN: White Nile, *Schweinfurth* No. 1028! Hb. Schweinf., etc.; Gebel el Ain, *Dr. Pfund* No. 110! Hb. Schweinf.; West Kordofan, *Dr. Pfund* No. 111! Hb. Schweinf.; Kordofan, *Dr. Pfund* No. 112! Hb. Schweinf.; Between El Obeid and Malbes, *Dr. Pfund* No. 108! Hb. Schweinf.

ABYSSINIA: Near Gerasecca, *Schimper* (1838) No. 772! Hb. Kew., etc.; *Schimper* (1854) No. 167! Hb. Kew.

GERMAN EAST AFRICA: Dar-es-Salam, *Holtz* No. 200 *a*! Hb. Berol.

NYASALAND: Between Kondowe and Karonga, *Whyte*! Hb. Kew.

PORTUGUESE EAST AFRICA: Cabaceira, *Dr. Peters*! Hb. Berol.

RHODESIA: Boruma, *Menyharth*! Hb. Schinz.

Dr. Chiovenda, in Ann. Ist. Bot. Roma, viii. p. 400, considers *Schimper* No. 772 to be *C. cylindrica*, A. Rich.; but according to material kindly lent to me from Paris, this species and *C. tigrensis*, Baker, are synonymous and quite distinct from *C. maxillaris*, Klotzsch.

157. C. VIRGULATA, *Klotzsch in Peters's Mossamb., Bot.* 56 (1862).
C. virgatula, Baker in Oliver, Fl. Trop. Afr. ii. 30.

Suffruticosa, virgata, puberula, ramosissima. *Stipulæ* parvæ. *Folia* trifoliolata, ab congeneribus differt foliolis angustioribus cuneato-oblongis, foliolis terminalibus 12–20 mm. longis 3·5–5 mm. latis lateralibus cuneato-obovatis minoribus, petiolo communi 3–5 mm. longo prædita. *Flores* in racemos laxos dispositi et in axillis foliorum supremorum. *Calyx* pubescens; laciniæ lanceolatæ. *Vexillum* extus pubescens. *Carina* dorso angulo recto curvata, inde in rostrum rectum attenuata, in toto 8–10 mm. longa. *Legumen* obovatum, puberulum, 4–5-spermum.

PORTUGUESE EAST AFRICA: Various collectors.

158. C. SENEGALENSIS, *Bacle in DC. Prod.* ii. 133 (1825); *Guill. & Perr. Fl. Seneg. Tent.* 165; *Benth. in Hook. Lond. Journ. Bot.* ii. 582; *Baker in Oliver, Fl. Trop. Afr.* ii. 31; *Hiern, Cat. Welw. Afr. Pl.* i. 202.
C. gracilis, Perr. in litt.
C. uncinella, Pers., *γ. senegalensis*, Pers. Ench. ii. 285 (1807).

Herba erecta vel prostrata. *Caulis* herbaceus, 3–6 dm. altus, basi glaber, apicem versus pubescens, ramosissimus. *Stipulæ* minimæ, deciduæ, subulatæ. *Folia* trifoliolata, foliolis cuneato-oblongis vel cuneato-oblongo-obovatis in forma typica 10–32 mm. longis 6–15 mm. latis superne glabriusculis subtus leviter pubescentibus, petiolo 9–25 mm. longo suffulta. *Flores* in forma typica parviusculi, in racemos laxos 9–15 cm. longos dispositi. *Bracteæ* ad basin pedicelli parvæ, lineares. *Bracteolæ* ad basin calycis parvæ. *Calyx* pubescens, dentibus lanceolatis. *Vexillum* intense flavum. *Alæ* flavæ. *Carina* vexillo longior, 7–9 mm. longa. *Legumen* oblongo-obovoideum, sessile, 8·14 mm. longum, pubescens, 8–12-spermum, pendulum.

SENEGAMBIA: *Perrottet* No. 165! Hb. Mus. Paris, type.

The true *C. senegalensis*, Bacle, has a lax raceme of rather small flowers, and is very widely distributed in Tropical Africa, more especially in Senegal and in Abyssinia.

Var. MACILENTA, *Chiov. in Ann. Ist. Bot. Roma*, viii. (1903) 82.

C. macilenta, Delile, Cent. Pl. Afr. t. 3. f. 2.

Caulis firmior. *Folia* majora. *Flores* majores. *Legumina* 8–10 mm. longa.

SUDAN : Nubia, *Kotschy* No. 24 ! Hb. Kew., etc.

ERITREA : *Schweinfurth & Riva* No. 650 ! (sub nom. *C. lupinoides*, Hochst.) Hb. Kew.

This variety has larger flowers than the type. It is very closely allied to the following variety, but has rather smaller flowers and smaller pods.

Var. CARINATA, *Steud. Unio Iter.* No. 519 non No. 772, pro sp.

C. remotiflora, Hochst. in Pl. Schimp. No. 2266.

Annua, ramosa. *Folia* trifoliolata, foliolis ellipticis vel oblongo-ellipticis intermediis majoribus 15–30 mm. longis 4–10 mm. latis. *Flores* quam in typo majores. *Racemi* laxi, 3–13 cm. longi, quam racemi *C. maxillaris*, Klotzsch, breviores. *Calycis tubus* laciniis brevior. *Carina* dorso angulata, 11–13 mm. longa. *Legumina* oviformia, pubescentia, sessilia, 10–11 mm. longa, pendula.

ERITREA : Keren, *Steudner* No. 51 ! Hb. Kew.

ABYSSINIA : Near Dochli, *Schimper* No. 519 ! Hb. Mus. Brit. ; Agow, *Schimper* No. 2266 ! Hb. Kew.

This variety is intermediate between *C. senegalensis*, Bacle, and *C. maxillaris*, Klotzsch. *Schweinfurth* No. 233 distributed as *C. remotiflora*, Hochst., is quite distinct. It differs both in the shape of the leaves and in the pods.

The racemes in var. *carinata* are 3–13 cm. long, shorter than in *C. maxillaris*, the calyx is ±6 mm. long.

Var. SANGUINOLENTA, *Chiov. in Ann. Ist. Bot. Roma*, viii. (1903) 399.

Corollæ luteæ, sanguineo colore præsertim ad nervos vexilli suffusæ.

ERITREA : Bogos, *Tellini* No. 1179, Hb. Roma.

159. C. LABURNOIDES, *Klotzsch in Peters's Mossamb., Bot.* 57 (1862).

Suffruticosa, erecta, ramosa, tenuissime pubescens. *Stipulæ* parvæ, acutæ. *Folia* trifoliolata, foliolis inæqualibus intermediis majoribus 40–50 mm. longis 15–20 mm. latis, lateralibus sæpe circ. 27 mm. longis et 11–14 mm. latis, petiolo communi circ. 13–23 mm. longo suffulta. *Flores* in racemos laxifloros oppositifolios dispositi, brevi-pedicellati, bractea reflexa suffulti.

Racemi 9–11 cm. longi. *Calyx* ringenti-campanulatus, profunde quinquefidus, pubescens, laciniis lanceolatis. *Vexillum* extus pubescens. *Carina* apice in rostrum attenuata.

ZANZIBAR: *Peters* ! Hb. Berol.

GERMAN EAST AFRICA: Mandera, *Stuhlmann* No. 8098 ! Hb. Berol.

160. C. AFRICANA, *Buscal. & Muschler in Engl. Jahrb.* xlix. (1913) 470.

Frutex vel *suffrutex* ramosissimus, ad *C. oocarpam*, Baker, accedens. *Stipulæ* minutæ. *Rami* adscendentes, dense pubescentes. *Folia* longe petiolata, trifoliolata, foliolis oblongo-ovatis vel obovatis 10–15 mm. longis 7–10 mm. latis juventute pilis utrinque obtectis. *Racemi* multiflori. *Pedicelli* satis longi. *Calyx* dense subsericeo-pubescens. *Corolla* lutea, calyce paullo longior. *Carina* dorso angulo recto curvata. *Legumen* immaturum oblongum, sessile, dense piloso-sericeum, oligospermum.

BRITISH EAST AFRICA: Guasso Nyiro, *Herzogin Helena von Aosta* No. 1602 ! Hb. Berol.

161. C. OOCARPA, *Baker in Kew Bulletin* (1897) 252.

Suffrutex ramosus. *Rami* adscendentes, pallide virides, pubescentes. *Stipulæ* parvæ, lineares. *Folia* trifoliolata, foliolis oblongis acutis mucronatis 12–30 mm. longis 5–7 mm. latis supra subglabris subtus pubescentibus, petiolo communi 5–25 mm. longo suffulta. *Flores* mediocres vel majusculi, in racemos laxos dispositi. *Bracteæ* 2, lineares, ad basin pedicelli. *Bracteolæ* 2, lineares. *Pedicelli* graciles, patentim hirsuti. *Corolla* lutea. *Calyx* pilosus, totus circ. 8–10 mm. longus; laciniæ lanceolatæ. *Vexillum* suborbiculari-obovatum, extus pubescens. *Alæ* carina breviores. *Carina* dorso genuflexa, apice in rostrum attenuata, in toto circ. 15 mm. longa. *Legumen* sessile, oviforme, 10–12 mm. longum, dense pilosum, oligospermum.

NYASALAND: Nyika Plateau, alt. 2000–2330 m., *Whyte* ! Hb. Kew.; Between Mpata and the commencement of the Nyasa-Tanganyika Plateau, 220–330 m., *Whyte* ! Hb. Kew.

This species is easily distinguished from its nearest allies by the very hairy calyx 8–10 mm. long, the keel about 15 mm. long, and the densely pilose, few-seeded pods 10–12 mm. long.

I hardly think *C. pilosiflora*, Baker in Kew Bulletin (1897) 251, can be maintained as a distinct species.

162. C. PLATYSEPALA, *Harvey, Thes. Cap.* i. (1859) 19, t. 29; *Baker in Oliver, Fl. Trop. Afr.* ii. 34.

C. apiculata, Schinz in Mém. Herb. Boiss. No. 1, 126 (1900).

Caulis erectus, usque ad 0·6 m. altus. *Folia* trifoliolata, foliorum

inferiorum foliolis intermediis quam lateralibus majoribus cuneato-oblongis vel ellipticis lateralibus cuneato-ovatis usque ad 55 mm. longis et 20 mm. latis, supremorum foliolis minoribus, petiolo communi 10–32 mm. longo suffulta. *Flores* in racemos laxos 10–20 cm. longos dispositi. *Calyx* maxime notabilis; lobi lati, abrupte in cuspidem attenuata. *Carina* dorso angulo recto curvata inde in rostrum attenuata in toto 9–12 mm. longa. *Legumen* oviforme, sessile.

NGAMILAND: *McCabe* No. 8! Hb. Kew.; *Lieut. Lugard* Nos. 158! 238! Hb. Kew.; Kwebe Hills, *Mrs. Lugard* No. 178! Hb. Kew.

AMBOLAND: Ombalambuenge, *Rautanen* No. 224! Hb. Turic.

A plant allied to the above was collected by *Mr. C. E. F. Allen* No. 2 at the Victoria Falls, but the sepals are not so broad.

163. C. DISTANS, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 582; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 43.

Herbacea vel *suffruticosa*, puberula, ramosa, erecta vel adscendens. *Rami* virgati, subteretes. *Stipulæ* angustæ. *Folia* trifoliolata, foliolis oblongo-linearibus vel lanceolatis obtusis vel mucronatis 6–25 mm. longis 2–8 mm. latis superne glabris subtus minute et adpresse pubescentibus, petiolo communi 5–15 mm. longo prædita. *Racemi* oppositifolii, distanter 2–6-flori. *Bracteæ* parvæ. *Calyx* ±5 mm. longus. *Vexillum* flavum. *Carina* apice in rostrum attenuata, in toto 13–14 mm. longa. *Legumen* sessile, oblongo-ovale, 12–15 mm. longum, minute puberulum.

TRANSVAAL: Lay Spruit and Tal River, *Burke & Zeyher*! Hb. Mus. Brit.; Hoggevelt, *Rehmann* No. 6787! Hb. Mus. Brit.; Lydenburg, *Wilms.* No. 343! Hb. Kew.; South African Gold Fields, *Baines*! Hb. Kew.

BECHUANALAND: Mafeking, *F. Bolus* No. 6445! Hb. Kew.

PONDOLAND: *Bachmann* No. 695! Hb. Berol.

NATAL: Weenen, *Wood* No. 987! Hb. Mus. Brit.; Natal, *Gerrard* No. 1725! Hb. Kew.

164. C. FORBESII, *Baker in Oliver, Fl. Trop. Afr.* ii. 18 (1871).

C. lævigata Lam. var. *villosior*, Benth. in Hook. Lond. Journ. Bot. ii. 577.

Suffruticosa, erecta, 30–45 cm. longa, griseo-pubescens, ad *C. virgulatam*, Klotzsch, accedens. *Stipulæ* lineares. *Folia* trifoliolata, petiolata, foliolis oblanceolatis intermediis 8–12 mm. longis. *Flores* solitarii vel 2 vel 3 vel in axillis foliorum dispositi. *Pedicelli* ± 2 mm. longi. *Calyx* sericeus, circ. 6 mm. longus, dentibus lanceolatis acuminatis. *Corolla* calyce duplo longior. *Vexillum* striatum. *Carina* 11–13 mm. longa. *Legumen* sessile, circ. 10 mm. longum, sericeum, 10–12-spermum.

PORTUGUESE EAST AFRICA: Mozambique, *Forbes*! Zambesiland, *Kirk*! Hb. Kew.

165. C. JUNODIANA, *Schinz in Herb. Schinz.*

Annua, ad *C. senegalensem*, Bacle, var. *carinatam*, Steud., valde accedens, ramosa, ramis divaricato-adscendentibus pubescentibus. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis cuneato-oblongis vel cuneato-ellipticis intermediis majoribus lateralibus 11–15 mm. longis 5–7 mm. latis, intermediis 20–27 mm. longis, subtus pubescentibus, petiolo communi 10–16 mm. longo instructa. *Flores* lutei, in racemos 3–12-floros laterales laxos 5–12 cm. longos dispositi. *Bracteolæ* parvæ. *Calyx* extus pubescens vel hirsutus; laciniæ lanceolatæ. *Vexillum* calyce longius, dorso pubescens, luteum, orbiculari-obovatum. *Alæ* oblongæ. *Carina* dorso angulo recto curvata, inde in rostrum rectum sensim attenuata, 7–9 mm. longa. *Legumina* pubescentia, oviformia, sessilia, 17–20 mm. longa.

PORTUGUESE EAST AFRICA: Delagoa Bay, *H. Junod* No. 388! Hb. Schinz.

166. C. GRANTIANA, *Harvey in Harvey & Sonder, Fl. Cap.* ii. 43 (1861–62).

Erecta, ramosa, herbacea. *Rami* adpresse pubescentes. *Stipulæ* setaceo-subulatæ. *Folia* trifoliolata, foliolis cuneato-oblongis 10–20 mm. longis 4–8 mm. latis superne glabris subtus adpresse pubescentibus, petiolo 3–8 mm. longo prædita. *Flores* flavi, ad apicem pedicellorum 1–2, vel in racemos laxos 3–5-floros dispositi. *Bracteæ* sub pedicellis parvæ. *Bracteolæ* parvæ, ultra medium pedicelli positæ. *Calyx* totus 5–5·5 mm. longus. *Vexillum* extus pubescens. *Alæ* carina breviores. *Carina* 7–9 mm. longa, dorso angulo recto curvata, inde in rostrum gracile attenuata. *Legumen* oviforme, sessile, 9–11 mm. longum, pubescens, multispermum.

RHODESIA: Boruma, *Menyharth* No. 1012! Hb. Schinz.

TRANSVAAL: Reg. Trop., *R. Schlechter* No. 4585! Hb. Turic.; Between Komati Poort and Letaba River, *F. A. Rogers* No. 2680! Hb. Kew.

ORANGE FREE STATE: *T. Cooper* No. 2237! Hb. Kew.

EAST GRIQUALAND: Clydesdale, *W. Tyson* No. 2798! Hb. Mus. Brit.

CAPE: District of Albany, *Bowie*! Hb. Mus. Brit.

NATAL: Port Natal, *Dr. W. B. Grant*! Hb. Kew.; near Durban, *Wood*! Hb. Mus. Brit.; Inanda, *Wood* No. 614! Hb. Kew.; Gwenberg, *Wood* No. 614! Hb. Mus. Brit.; River Unkomanzi, *R. Schlechter* No. 6678! Hb. Turic.

A slender plant with thread-like peduncles allied to *C. senegalensis*, Bacle.

167. C. KURTII, *Schinz in Viertelj. Nat. Ges. Zürich*, lii. (1907) 422.

C. Dinteri, Schinz in Bull. Herb. Boiss. sér. 2, iii. (1903) 819.

Radix lignosa. *Caules* teretes, complures ex eadem radice orti. *Stipulæ* circ. 1 mm. longæ. *Folia* trifoliolata, foliolis oblongis intermediis majoribus 5–20 mm. longis 3–5 mm. latis, petiolo communi 5–10–15 mm. longo suffulta.

Flores mediocres, in racemos paucifloros laxissimos dispositi. *Bracteæ* parvæ. *Pedicelli* graciles. *Calyx* 5·5–6·0 mm. longus, dentibus lanceolatis. *Vexillum* circ. 11 mm. longum. *Alæ* carina breviores. *Carina* dorso angulo recto curvata, 10–12 mm. longa. *Legumina* oviformia, 10–12 mm. longa, brevissime stipitata, pubescentia, 2–3-sperma.

HEREROLAND: Waterburg Plateau, *Dinter* No. 583! Hb. Turic.

This species must not be confused with *C. Dinteri*, Schinz in Bull. Herb. Boiss. sér. 2, i. (1901) 875.

C. Kurtii, Schinz, can be recognised from its nearest allies by the very lax 1–3-flowered racemes, and the oblong or oblong-lanceolate leaflets.

Series 20. Flores mediocres vel majusculi, in racemos laxos sæpe 10–20-floros dispositi. Carina dorso rotundata, 14–15 mm. longa, rostro brevi. Stipulæ setaceæ, longiusculæ. Legumen oblongum, pilis brunneis obtectum, basi attenuatum. Suffrutex bimetralis.

168. C. MAUENSIS, *Bak. fil.*, sp. nov.

Suffrutex erectus, ramosus, sursum pube brevi ferrugineo dense obtectus. *Stipulæ* 6–12 mm. longæ. *Folia* trifoliolata, foliolis ovato-ellipticis vel ovatis 20–50 mm. longis, 16–23 mm. latis, petiolulatis pubescentibus, petiolo communi 50–75 mm. longo prædita. *Flores* majusculi. *Bracteolæ* ad basin calycis 2, lineares, 7–9 mm. longæ. *Calyx* 14–16 mm. longus, lobis ovatis tubo brevioribus. *Alæ* inæquilateraliter obovatæ, cum unguibus circ. 15 mm. longæ, 9–10 mm. latæ. *Carina* vix rostrata, cum unguibus 14–15 mm. longa, calycem subæquans. *Legumen* basi in stipitem brevem attenuatum, cum stipite circ. 60 mm. longum, pilis brunneis obtectum, multispermum.

BRITISH EAST AFRICA: Mosi, *C. F. Elliot* No. 269! Hb. Kew.; Lamuru, *Scheffler* No. 272! Hb. Berol.; Eldoma Ravine, *A. Whyte*! Hb. Kew.; One day's march from Ravine, *A. Whyte*! Hb. Kew.; Masai Highlands, Mau Plateau, *Guy Baker* No. 27! Hb. Kew.

This is a plant about 2 m. high, with a lax raceme. The calyx is about the same length as the corolla, the bracts are 8–10 mm. long. The pod is oblong, attenuate at both ends, covered with brown hairs. Common all over the Mau Plateau on edges of forest and open spaces.

Series 21. Flores mediocres, in racemos laxos dispositi. Carina angulo fere recto curvata, 10–12 mm. longa. Stipulæ obsoletæ vel oculo nudo non conspicuæ. Legumen oblongo-clavatum. Perennis.

169. C. PEARSONII, *Bak. fil.*, sp. nov.

Perennis, erecta, ramosa. *Rami* pilis albis strigosis obtecti. *Folia*

digitatim trifoliolata, foliolis ovatis vel cuneato-obovatis 7–10 mm. longis 4–8 mm. latis subtus pilis cinereis vestitis, petiolo communi 8–12 mm. longo prædita. *Flores* in racemos laxiusculos 5–18-floros dispositi, pedicellis gracilibus 2–4 mm. longis. *Calyx* pilis albidis vestitus, in toto 5–7 mm. longus, laciniis lanceolatis tubo longioribus. *Bracteæ* parvæ, pedicellis brevioribus. *Bracteolæ* parvæ, apicem versus pedicellorum positæ. *Vexillum* obovatum, lineis brunneis notatum. *Alæ* carina breviores. *Carina* dorso angulo fere recto curvata vel genuflexa, apice in rostrum circ. 4 mm. longum sursum flexum attenuata. *Legumen* immaturum, basi in stipitem brevem attenuatum, pilosum, plurispermum.

NAMAQUALAND: Doornpoort Ravine, about 670 m., *H. H. W. Pearson* No. 6131! Hb. Capensis. Collected on Percy Sladen Memorial Expedition to the Orange River, Jan. 1st, 1911.

Petals yellow with brown markings. Allied to *C. pallida*, Dryander.

Series 22. Flores mediocres vel majusculi, in racemos multifloros dispositi. Carina dorso rotundata, 7–15 mm. longa, sæpius lineis eleganter notata. Stipulæ parvæ vel nullæ. Legumina oblonga vel cylindrica, sessilia vel brevissime stipitata. Herbæ vel suffrutices, erecti.

170. C. LANCEOLATA, *E. Mey. Comm.* 24 (1835); *Benth. in Hook. Lond. Journ. Bot.* ii. 585; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 43; *Baker in Oliver, Fl. Trop. Afr.* ii. 36; *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 207, pro parte.

C. mossambicensis Klotzsch in Peters's Mossamb., Bot. 61, t. 10.

Caulis erectus, ramosus, virgatus, pube brevi obtectus. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis lanceolatis lineari-lanceolatis vel oblongis 30–70 mm. longis sæpius 8–16 mm. latis subtus puberulis, petiolo communi 20–40 mm. longo prædita. *Flores* parviusculi, in racemos multifloros vel plurifloros elongatos dispositi. *Bracteæ* parvæ, angustæ. *Calyx* circ. 3 mm. longus, dentibus brevibus. *Vexillum* flavum, striatum. *Alæ* oblongæ. *Carina* falcata vel subfalcata, in toto 7–8 mm. longa, lineata. *Legumina* cylindrica, 30–40 mm. longa, sessilia, appresse pubescentia, multisperma.

GERMAN EAST AFRICA: South Uluguru, *Goetze* No. 358! Hb. Berol.

NYASALAND: Shiri Highlands, *Buchanan* No. 356! (1881); *Adamson* No. 327! Hb. Kew.

PORTUGUESE EAST AFRICA: Mozambique, *Peters*! Zambesi, *Kirk*! *Stewart*! Hb. Kew.; Delagoa Bay, *Junod* No. 385! Hb. Turic.

CONGO REGION: Dolo, *R. Schlechter* No. 12476! Hb. Turic.

GAZALAND: Near Chirinda Forest, *C. F. Swynnerton* No. 479! Hb. Mus. Brit.

NATAL: Alexandra, *Rudatis* No. 3099! Hb. Turic.; Inanda, *Rehmann*

No. 8414! Hb. Turic.; Durban, *Wood* No. 249! Hb. Turic.; South Africa, Reg. Orient, *Schlechter* No. 6697! Hb. Turic.; Port Natal, *Krauss* No. 469! Hb. Mus. Brit.

EAST GRIQUALAND: Clydesdale, near River Umzimkulu, *Tyson* No. 2757! Hb. Turic.

This plant has rather small, yellow flowers, with dark purple veins in terminal, lax, elongate racemes. The Mascarene *C. Bernieri*, Baill., is a close ally.

Var. nov. SEPTENTRIONALIS, *Bak. fil.*

Erecta, puberula, ramosa. *Foliola* linearia. *Flores* majores. *Calyx* circ. 3 mm. longus, dentibus brevibus. *Vexillum* lineatum. *Alæ* vexillo breviores. *Carina* falcata, margine interiore pubescente, apice curvata, acuta, in toto 10–12 mm. longa. *Legumen* oblongum, 20–23 mm. longum.

GERMAN EAST AFRICA: *Stuhlmann* No. 7436! Hb. Berol., Hb. Schinz.

Differs principally in having a longer carina.

Var. nov. MALANGENSIS, *Bak. fil.*

Caulis erectus, virgatus, in longitudinem striatus, circ. 40 cm. altus. *Folia* trifoliata, vel suprema 2-foliolata, foliolis angustioribus 25–60 mm. longis 1·5–2·0 mm. latis, petiolis brevioribus 4–10 mm. longis instructa. *Flores* parviusculi, in racemum terminalem dispositi. *Racemi* 6–10 cm. longi. *Bracteæ* circ. 2 mm. longæ. *Calyx* circ. 3·5–4·0 mm. longus, dentibus brevibus. *Carina* falcata, apice acuta, lineis atro-purpureis notata, in toto circ. 7–8 mm. longa. *Legumina* pubescentia, oblonga vel oblongo-cylindrica.

ANGOLA: Malange, *Mechow* No. 468! Hb. Schinz.

Differs from the type in the very narrow leaflets and the shorter petioles.

An interesting little plant occurs on the Island of Mayotte. It is a close ally of *C. lanceolata*, Mey., but the carina is smaller, only ±5 mm. long. It was collected by *Boivin* No. 3426, Hb. Berol.

171. C. FALCATA, *Vahl ex DC. Prod.* ii. 132 (1825); *Benth. in Hook. Lond. Journ. Bot.* ii. 585; *Baker in Oliver, Fl. Trop. Afr.* ii. 40.

Species ad *C. striatam*, DC., accedens, primo intuitu facile distinguenda caule magis fruticoso et diffuse divaricatim ramoso. *Caulis* ad 0·5–0·6 m. attingens, sursum tenuiter sericeus. *Folia* trifoliolata, foliolis obovatis intermediis 24–32 mm. longis et 18–24 mm. latis, superne glabris subtus tenuiter sereiceis, petiolo communi circ. 20–24 mm. longo instructa. *Flores* in racemos longiuscule pedunculatos dispositi. *Bracteæ* minutæ. *Calyx* sericeus, circ. 5–6 mm. longius, dentibus lanceolatis. *Corolla* flava. *Carina* falcata, incurva, in toto circ. 8–10 mm. longa. *Legumen* sessile, cylindricum, 25–30 mm. longum, juvenile sericeum, 15–20-spermum.

GOLD COAST: Accra, *Brown* No. 400! Hb. Kew.
LAGOS: *Moloney*! Hb. Kew.
NIGERIA: Niger Country, *Ansell*! *Vogel*! Hb. Kew.
CONGO REGION: Nouvelle Anvers, *De Giorgi* No. 296, Hb. Brux.

172. C. STRIATA, *DC. Prod.* ii. 131 (1825); *Bot. Mag.* t. 3200; *Baker in Oliver, Fl. Trop. Afr.* ii. 38.
C. pisiformis, Guill. & Perr. Fl. Seneg. Tent. 162 (1832).
C. pallida, Klotzsch in Peters's Mossamb., Bot. 57 (1862).
C. fertilis, Delile in Ferr. & Gall. Voy. Abyss. 122, t. 11.

Caulis suffruticosus, adscendens vel erectus, sæpius 0·5–1·5 m. alt., novellis griseo-sericeis. *Stipulæ* parvæ vel deciduæ. *Folia* trifoliolata, foliolis oblongo-obovatis vel obovatis basi cuneatis apice rotundatis vel emarginatis 25–80 mm. longis 11–50 mm. latis pubescentibus, petiolo communi 30–70 mm. longo suffulta. *Flores* mediocres, in racemos multifloros dispositi, lutei, striis purpureis picti. *Calycis laciniæ* lanceolatæ. *Vexillum* calyce subduplo longius. *Alæ* oblongæ, carina breviores. *Carina* falcata, 10–13 mm. longum. *Legumina* lineari-oblonga, stipitata, 20–40 mm. longa, circ. 20–30-sperma.

Widely distributed in Tropical Africa. Also a plant of Natal, Mascarene Islands, Tropical Asia, and America.

173. C. OBOVATA, *G. Don, Gen. Syst.* ii. 138 (1832).

Species ad *C. striatam*, DC., valde accedens. *Caulis* erectus, ramosus, pubescens. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis obovatis vel elliptico-obovatis subtus pubescentibus breviter petiolulatis lateralibus 3·5–5·0 cm. longis 1·5–3·0 cm. latis, terminalibus majoribus 4·0–5·5 cm. longis 3·5–4·0 cm. latis, petiolo communi 4·0–4·5 cm. longo instructa. *Flores* numerosi, lutei, in racemos dispositi. *Bracteæ* parvæ, pedicello breviores. *Bracteolæ* ad basin calycis positæ, lineares. *Calyx* albo-pubescens, vel subtomentosus, dentibus lanceolatis. *Vexillum* luteum, calyce longius, ±11 mm. longum. *Alæ* oblongæ, luteæ, carina conspicue breviores. *Carina* falcata vel subfalcata, dorso rotundata, apice in rostrum attenuata, 10–12 mm. longa. *Legumen* cylindricum, basi breviter stipitatum, cum stipite circ. 15–20 mm. longum, pubescens vel breviter tomentosum, circ. 8–10-spermum.

GOLD COAST: Accra, *G. Don*! Hb. Mus. Brit.

NIGERIA, *Dalziel* No. 341! Hb. Kew.

The raceme of yellow flowers is 4–10 cm. long, the falcate carina 10–12 mm. long, not so conspicuously striate as in *C. striata*, DC., and the pod is shorter.

174. C. Kirkii, *Baker in Oliver, Fl. Trop. Afr.* ii. 36 (1871).

Caulis erectus, ramosus, suffruticosus, striatus. *Stipulæ* nullæ. *Folia* trifoliolata, petiolata, foliolis anguste linearibus vel lineari-oblongis superne glabris viridibus subglaucis subtus tenuiter griseo-sericeis. *Flores* mediocres in racemos subdensos dispositi. *Pedicelli* erecto-patentes. *Calyx* glaber, dentibus subulatis tubo breviores. *Vexillum* suborbiculare, lineis striatum. *Alæ* carina breviores. *Carina* dorso rotundata, apice acuta, 10–12 mm. longa. *Legumen* cylindricum, 20–23 mm. longum.

German East Africa: Bagamoyo, *Kirk*! Dar Salam, *Kirk*! *Hildebrandt* No. 1210! Hb. Kew.

Allied to *C. lanceolata*, E. Mey., differs by the larger flowers, etc.

175. C. Nicholsonii, *Bak. fil.*, sp. nov.

Erectus, virgatus, ad *C. lathyroidem*, Guill. & Perr., accedens. *Caulis* longitudinaliter striatus, pubescens. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis ellipticis vel ovatis 40–50 mm. longis 15–20 mm. latis, costa subtus conspicua subtus sparse pilis obtectis, petiolo communi 15–25 mm. longo suffulta. *Flores* in racemos terminales multifloros dispositi. *Racemi* circ. 10 cm. longi. *Bracteæ* lineares, parvæ, pedicello breviores. *Bracteolæ* parvæ, ad basin calycis lineares. *Calyx* 5 mm. longus, extus hirtus, dentibus lanceolatis. *Vexillum* suborbiculari-obovatum. *Alæ* oblongæ ±10 mm. longæ, in sicco flavæ. *Carina* falcata, in sicco eleganter lineis atro-purpureis striatum, 10–11 mm. longa. *Ovarium* lineari-oblongum. *Legumen* oblongum.

Nyasaland: Kyimbila, *Stolz*, No. 217! Hb. Berol.

Rhodesia: Loangwene, *Dr. T. G. Nicholson*, Hb. Kew.

Allied to *C. lathyroides*, Guill. & Perr. The distinguishing features of *C. Nicholsonii* are the trifoliolate leaves with ovate or elliptical leaflets, the raceme of flowers, and the falcate carina which is 10–11 mm. long and like the standard marked with dark purple striations.

176. C. usaramoensis, *Bak. fil.*, sp. nov.

Herbacea, elata, ad *C. lanceolatam*, E. Mey., accedens, caule insigniter striato-pubescente. *Stipulæ* subnullæ. *Folia* remota, petiolata, foliolis quam iis *C. lanceolatæ*, E. Mey., brevioribus et latioribus anguste ellipticis apice subacuminatis basi cuneatis 4–6 cm. longis 10–16 mm. latis supra glabris subtus strigoso-pubescentibus. *Flores* pedicellati, numerosi, in racemos terminales elongatos dispositi. *Bracteæ* lineares, 3·5–4·0 mm. longæ. *Pedicelli* graciles, 3–5 mm. longæ. *Racemi* 15–25 cm. longi. *Calyx* glaber; tubus 3·5 mm. longus, campanulatus, dentibus acuminatis 1·5 mm. longis, tubo brevioribus. *Vexillum* in sicco luteum, striatum, cum ungue 10 mm. longum. *Carina* dorso rotundata, apice acuta, ± 11 mm. longa, lineis striata, falcata, unguiculata. *Ovarium* lineari-oblongum, basi breviter stipitatum, multiovulatum. *Legumen* oblongo-cylindricum, juvenile 20–23 mm. longum, pubescens.

GERMAN EAST AFRICA: Usaramo, *Stuhlmann*! Hb. Berol.; Maogoro, *Stuhlmann*, alt. 500 m., No. 8216! Hb. Berol.

Differs from *C. lanceolata*, E. Mey., by the shape of the leaflets, etc.

177. C. CLEOMOIDES, *Klotzsch in Peters's Mossamb., Bot.* i. 59 (1862).

Herbacea erecta, simplex. *Caulis* striatus, teres, glaber. *Stipulæ* nullæ. *Folia* trifoliolata, foliolis anguste oblongis mucronatis supra læte viridibus glabris subtus glaucescentibus sparsissime pubescentibus, petiolo communi 28–32 mm. longo suffulta. *Flores* mediocres, in racemos plurifloros dispositi. *Bracteæ* lanceolato-subulatæ. *Calyx* oblique campanulatus, quinque-dentatus, dentibus subulatis. *Corollæ* petala flavida, atro-fusco-lineata. *Vexillum* carina distincte brevius, circ. 8–9 mm. longum. *Carina* 10–11 mm. longa, lineis atro-purpureis notata. *Ovarium* oblongum. *Legumen* ignotum.

PORTUGUESE EAST AFRICA: Rios de Sena, *Peters*! Hb. Berol.

The standard in this species is distinctly shorter than the keel; the keel is veined with dark purple veins.

178. C. ZANZIBARICA, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 584; *Baker in Oliver, Fl. Trop. Afr.* ii. 35; *Taubert in Engler Pflanzenwelt Ost-Afr.* C. 207.

Suffrutex. *Caulis* erectus, striatus, pube denso griseo indutus. *Stipulæ* nullæ. *Folia* membranacea, trifoliolata, foliolis ellipticis oblongis vel oblongis, intermediis majoribus 45–60 mm. longis 12–25 mm. latis superne glabris subtus tenuiter sericeis petiolulatis, petiolo communi circ. 20 mm. longo suffulta. *Flores* mediocres, lutei, in racemos sæpius multifloros dispositi. *Bracteæ* parvæ. *Pedicelli* sericei. *Calyx* oblique campanulatus, circ. 4–5 mm. longus, dentibus brevibus deltoideis. *Vexillum* suborbiculari-obovatum. *Carina* dorso rotundata, apice acuta, in toto 12–15 mm. longa. *Ovarium* dense sericeum. *Legumen* adhuc ignotum.

ZANZIBAR: *Bojer*! Hb. Kew.

Also from Mauritius.

Thomas No. 178 from Witu is allied, but differs in the shape of the leaflets.

179. C. ROGERSII, *Bak. fil.*, sp. nov.

Caules plures, virgati, erecti, pubescentes, basi suffruticosi. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis glauco-oblongis vel oblongis-ellipticis 25–60 mm. longis 7–16 mm. latis viridibus pubescentibus, petiolo communi superne canaliculato 10–20 mm. longo suffulta. *Flores* mediocres, in racemos dispositi. *Bracteæ* lineares. *Bracteolæ* ad basin calycis adnatæ, lineares. *Calycis* tubus campanulatus, dentibus lanceolatis pubescentibus. *Vexillum* luteum, striatum, calyce subtriplo longius. *Alæ* aurantiacæ. *Carina* falcata, apice acuta, in toto 13–15 mm. longa, alis subduplo longior. *Legumina*

oblonga vel lineari-oblonga, breviter stipitata, apice vestigiis styli coronata, cum stipite 25–30 mm. longa, extus pubescentia, sæpe 9–12-sperma.

NYASALAND: Zomba, *Sharpe* No. 36! Hb. Kew.

RHODESIA: Mazabookes, *Rogers* No. 8330! Hb. Kew.; Mazoe Valley, *F. Eyles* No. 181! Hb. Mus. Brit.; Near Salisbury, *J. F. Darling* No. 10771! Hb. Kew.; *Dr. Rand* No. 455! Hb. Mus. Brit.; Manganya Hills, *J. C. Meller*! Hb. Kew.; Mumbwa, *Mrs. Macaulay* No. 816! Hb. Kew.

The alliance of this plant is with *C. Kirkii*, Baker, and *C. striata*, DC. The keel is coloured lake, the front of the standard orange with lake striations, the wings orange. The colour of the flowers together with the shape of the leaves distinguishes it from its nearest allies. A plant closely allied to the above was collected at Ndembera by Hauptm. Prittwitz von Gaffron No. 105, Hb. Berol.

180. C. PALLIDA, [*Dryander in*] *Aiton, Hort. Kew.* iii. 20 (1789).

Caulis erectus, cinereo-pubescens. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis cuneato-elliptico-oblanceolatis apice mucronatis petiolulatis ±45 mm. longis 11–22 mm. latis, petiolo communi pubescente 40–50 mm. longo instructa. *Flores* in racemos paucifloros dispositi, alabastris pendulis. *Bracteæ* lineares. *Bracteolæ* lineares, parvæ. *Carina* dorso rotundata, falcata vel subfalcata, apice acuta, striata, in toto 13–15 mm. longa. *Legumen* ignotum.

ABYSSINIA: Seeds from *Bruce* cultivated in Hort. Kew.

Allied to *C. striata*, DC. The specimen is not in very good condition.

Series 23. Flores mediocres vel majusculi lutei, in racemos multifloros et plus minus elongatos dispositi. Carina dorso rotundata, 7–16 mm. longa. Stipulæ parvæ. Legumina oblonga, subtomentosa vel pubescentia, sessilia vel breviter stipitata. Suffrutices erecti, sæpius elati, *C. cleomifoliæ*, Welw., affines.

181. C. OREADUM, *Bak. fil.*, sp. nov.

Suffrutex erectus, circ. 1·5 m. altus, insigniter striatus et sulcatus. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis oblongis vel oblongo-ellipticis 25–50 mm. longis 6–17 mm. latis subtus strigoso-pubescentibus, petiolo communi 7–15 mm. longo suffulta. *Flores* aurei, mediocres, numerosi, in racemos axillares et densos et terminales dispositi. *Bracteæ* lineares, persistentes, usque ad 6 mm. longæ attingentes. *Bracteolæ* angustæ. *Calyx* totus circ. 6 mm. longus, dentibus acutis. *Vexillum* suborbiculari-obovatum, aureum, striatum. *Alæ* oblongæ. *Carina* falcata, circ. 8 mm. longa. *Legumen* oblongo-cylindricum, 15–16 mm. longum, sessile, hirtum.

CAMEROONS: Markt Singwa, *C. Ledermann* No. 1712! Hb. Berol. "Mit gelben Blumen."

The noticeable features of this erect suffrutex are:—The sulcate branches, the small stipules, the numerous racemes of golden yellow flowers, the falcate carina 8 mm. long, the hairy oblong pod, 15–16 mm. long.

An ally of *C. cleomifolia*, Welw., but the leaves are trifoliolate.

182. C. Keilii, *Bak. fil. in Deutschen Zentral Afr. Exped.* Band ii. (1911) 245 (nomen).

Caulis erectus, usque ad 1 m. altus. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis ellipticis vel ovatis apice acutis 25–55 mm. longis 12–25 mm. latis superne glabris, petiolo communi 17–24 mm. longo instructa. *Flores* mediocres, in racemum elongatum dispositi. *Bracteæ* lineares, usque ad 8–10 mm. longæ. *Racemi* multiflori. *Pedicelli* pubescentes, usque ad 4–5 mm. longi. *Calyx* extus pubescens, in toto circ. 6 mm. longus. *Alæ* oblongæ, carina conspicue breviores, circ. 8 mm. longæ. *Carina* 11–12 mm. longa, apice acuta. *Legumen* oblongum, brevissime stipitatum, brunneo-tomentosum vel subtomentosum.

German East Africa: Usumbura, *L. Keil* No. 87! Hb. Berol.

J. Mildbraed No. 736 from Rugege is very closely allied.

Forma nov. Chevalieri, *Bak. fil.*

Foliola cuneato-obovata vel cuneato-ellipticis, 30–45 mm. longa, petiolo 25–35 mm. longo prædita. *Flores* paullo minores. *Carina* 9–10 mm. longa. *Legumen* brevissime stipitata, cum stipite 13–23 mm. longum.

French Equatorial Africa: Lake Chad & Kanem, *Chevalier* No. 10161! Hb. Kew.

183. C. longithyrsa, *Bak. fil.*, sp. nov.

Suffrutex erectus, ad *C. cleomifoliam*, Welw., accedens, pubescens, ramosus. *Folia* superiora trifoliolata, foliolis linearibus vel lineari-lanceolatis 50–90 mm. longis 5–9 mm. latis subtus strigoso-pubescentibus, petiolo communi 25–35 mm. longo instructa, foliis inferioribus ignotis. *Flores* flavi, mediocres, in racemos multifloros elongatos dispositi. *Racemi* circ. 30 cm. longi. *Bracteolæ* ad basin calycis parvæ, lineares, tubo breviores. *Bracteæ* lineares, pedicello breviores. *Pedicelli* tenues, 4–5 mm. longi. *Calyx* extus pubescens, 4–5 mm. longus, dentibus acutis. *Vexillum* circ. 11 mm. longum. *Carina* falcata vel subfalcata, dorso rotundata, 10–12 mm. longa. *Legumina* oblonga, immatura, cinereo-pubescentia brevissime stipitata.

Congo Region: Buli, *J. Bequaert* No. 68! Hb. Brux.

Differs from *C. cleomifolia*, Welw., by the trifoliolate leaves with long, narrow leaflets. Noticeable on account of the long, narrow raceme of yellow flowers, about 30 cm. long; the pod is oblong, depressed, shortly stipitate.

184. C. MUNTZNERI, *Bak. fil.*, sp. nov.

Caulis erectus, longitudinaliter striatus, circ. 1·5 m. alt. *Stipulæ* subnullæ, oculo nudo non conspicuæ. *Folia* trifoliolata, foliolis ovato-oblongis vel elliptico-oblongis apice acutis 5–7 cm. longis 15–20 mm. latis superne glabris subtus pubescentibus, petiolo 4–6 cm. longo suffulta. *Flores* majusculi, in racemum terminalem circ. 20 cm. longum multiflorum dispositi. *Racemus* densus vel subdensus. *Bracteæ* lineares, circ. 5 mm. longæ, caducæ. *Bracteolæ* lineares, ad basin calycis positæ. *Pedicelli* circ. 5 mm. longi. *Calyx* totus circ. 8 mm. longus, pubescens, dentibus acuminatis. *Vexillum* luteum, suborbiculari-obovatum, lineatum. *Alæ* oblongæ. *Carina* naviculariformis, 16 mm. longa, apice acuta, vix rostrata. *Ovarium* lineari-oblongum, stipitatum. *Legumen* juvenile oblongo-cylindricum, pubescens, subsessile.

NYASALAND: Tanganyika Nyassa Region, Kihanio, 1300 m., *Muntzner* No. 16! Hb. Berol. Expedition Hauptmann Fromm.

An erect suffrutex with golden yellow flowers allied to *C. Schumanniana*, Harms and *C. cleomifolia*, Welw.

185. C. SCHUMANNIANA, *Harms in Ann. Ist. Bot. Roma*, vii. (1897) 89.

Suffrutex erectus, tomentello-pilosus. *Stipulæ* lanceolatæ, subulatæ. *Folia* trifoliolata, foliolis oblongis vel anguste ellipticis basi apiceque acutis vel subacutis 5–6 cm. longis 2·5 cm. latis, supra glabris subtus dense sericeo-pilosis, petiolo 15–20 mm. longo suffulta. *Racemi* 8–12 cm. longi. *Bracteæ* longæ, filiformes, hirsutæ. *Calyx* ± 8 mm. longus. *Calyx* dentibus longiusculis subulato-lanceolatis. *Vexillum* longiuscule unguiculatum, ovatum, subrotundatum, basi leviter cordatum. *Carina* ± 18 mm. longum, rostratum, leviter striatum. *Ovarium* stipitatum, latere ventrali dense hirsutum.

SOMALILAND: Coromma, *Riva* No. 1407! Hb. Berol.

This species is noticeable on account of the long bracts.

186. C. CLEOMIFOLIA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 43 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 204.

Herba vel interdum suffrutex, usque ad 1–2 m. alt. *Folia* sæpius 5-foliolata, rarius 3-foliolata, foliolis membranaceis profunde viridibus superne nitidis subtus glaucis 4–10 cm. longis 12–32 mm. latis, petiolo pubescente 25–40 mm. longo instructa. *Flores* mediocres, in racemos dispositi. *Bracteolæ* ad basin calycis positæ, retroflexæ, ad pedunculi insertionem adpressæ. *Calyx* hirtus, vexillo compluries brevior, dentibus acutis. *Petala* sulphureo-flava. *Carina* falcata, 11–15 mm. longa, apice sursum flexa, acuta. *Legumen* breviter stipitatum, pubescens, demum glabrescens, subcylindricum, 30–40-spermum.

Widely distributed in Tropical Africa. Fairly common in West Tropical

Africa, especially the Congo Region. Rarer on the East side. Occurs in Uganda on Mt. Ruwenzori and is quite uncommon in British East Africa. Occurs in Nyasaland.

Easily recognised by the 5, more rarely 3 leaflets, which are of a deep green colour, and the racemes of sulphur-yellow flowers, with a carina rounded on the back.

Var. SERETI, *De Wild. in Ann. Mus. Congo, Bot.* sér. 5, iii. 198 (1912).

Foliola 9 cm. longa attingentia. *Legumen* appresse velutinum.

CONGO REGION: Between Amadi and Suronga, *Seret* No. 354 ! Hb. Brux.

Var. nov. KÄSSNERI, *Bak. fil.*

Caulis erectus, sursum magis cinereo-hirsutus. *Foliola* breviora, 25–45 mm. longa. *Bracteolæ* angustæ, ± 5 mm. longæ. *Carina* falcata, 15–16 mm. longa.

BRITISH EAST AFRICA: Galunka, *Kässner* No. 838 ! Hb. Mus. Brit.

Differs from the type in the rachis of the inflorescence, and the calyx being more densely cinereous-hirsute; the leaves are also shorter.

Series 24. Flores lutei, mediocres, in racemos pluri- vel multifloros dispositi. Carina falcata, 11–14 mm. longa. Stipulæ 0. Legumina oviformia vel oblonga, distincte stipitata. Suffrutex ramosus.

187. C. ARGYRÆA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 26 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 200, *non Franchet.*

C. Pechueliana, Schinz in Verh. Bot. Brand. xxx. (1888) 157.

Suffrutex 0·45–1·2 m. alt., erectus, argenteo-puberulus. *Stipulæ* 0. *Folia* trifoliolata, foliolis obovatis cuneato-ellipticis vel cuneato-oblongis sæpius 15–30 mm. longis 8–18 mm. latis glauco-viridibus, petiolo communi 10–25 mm. longo prædita. *Bracteolæ* parvæ. *Calyx* circ. 5 mm. longus, dentibus acutis. *Vexillum* calyce longius. *Alæ* oblongæ, carinam subæquantes. *Carina* apice acuta, dorso rotundata. *Legumen* 11–13 mm. longum; stipes 3–4 mm. longa.

ANGOLA: Mossamedes, Benguella, *Welwitsch* No. 1972 ! Hb. Mus. Brit.

AMBOLAND: Omapanda, *Wulfhorst* No. 30 ! Hb. Turic.; Omaruru, *Rautanen* No. 350 ! Hb. Turic.; Ovamboland, *Hopfner* No. 107 ! Hb. Schinz.

HEREROLAND: Rehmann ! Hb. Schinz; Okahandja, *Dinter* No. 300 ! Hb. Turic.; Augams, *Dinter* ! Hb. Turic.; *Luderitz* No. 146 ! Hb. Schinz; *Nels* No. 25 ! Omapu, *Schinz* No. 531 ! Hb. Schinz.

NAMAQUALAND: *Belck* No. 62 ! Hb. Schinz; Karakoes, *Schinz* No. 537 ! Hb. Schinz; River Onanis, *Belck* No. 62 ! Hb. Schinz; Rehoboth, *Dr. Fleck* No. 456 ! Hb. Schinz.

Series 25. Flores mediocres, in racemos breves et densos dispositi. Carina dorso rotundata, 10–12 mm. longa. Stipulæ nullæ. Legumen oblongum, ± 15 mm. longum, 6–10-spermum. Fruticosa, ramis albo-tomentosis.

188. C. ALBICAULIS, *Franchet in Revoil, Pays Çomalis*, 26 (1882).

Fruticosa, 2–4 dm. alta. *Folia* trifoliolata, foliolis oblongo-obovatis supra glabris subtus pube tenui indutis, petiolo communi sæpius 25–30 mm. longo prædita. *Racemi* breves, densiflori. *Pedicelli* cernui, calycem subæquantes. *Calyx* pubescens, ad medium usque 5-fidus, dentibus lanceolato-deltoideis superioribus vix brevioribus. *Corolla* 10–12 mm. longa. *Vexillum* mox erectum. *Carina* inferne ciliolata, valde arcuata, obtuse rostrata, alas multum superans. *Legumen* 6–10-spermum, pube tenui crispula indutum.

SOMALILAND : Revoil ! Hb. Mus. Paris ; Saskarato, *Donaldson Smith* ! Hb. Mus. Brit. ; Adda Galla, *James & Thrupp* ! Hb. Kew. ; Golis Range, *Drake-Brockman* No. 296 ! Hb. Kew.

The standard and keel are purple, the wings yellow.

Series 26. Flores mediocres, in racemos elongatos terminales multifloros laxiusculos dispositi. Carina dorso rotundata, 13–15 mm. longa, calycem paullo superans. Stipulæ lineares. Legumen subsessile, glabrum, oblongo-cylindricum, multispermum. Suffrutices erecti, glabri, vel leviter tomentosi.

189. C. RECTA, *Steud. ex A. Rich. Tent. Fl. Abyss.* i. 152 (1847) ; *Ferret et Gal. Voy. Abyss.* 121, tab. 10 ; *Baker in Oliver, Fl. Trop. Afr.* ii. 40.

Caulis elatus, erectus, simplex, suffruticosus. *Stipulæ* persistentes. *Folia* foliolis 3 glabris vel rarius tomentosis obovatis vel oblongo-obovatis 30–95 mm. longis 15–40 mm. latis, petiolo communi 12–22 mm. longo prædita. *Flores* in racemum elongatum dispositi. *Bracteæ* lineares. *Bracteolæ* parvæ. *Calycis laciniæ* acutæ. *Vexillum* late obovatum, calycem superans, striatum. *Alæ* oblongæ. *Carina* naviculariformis, circ. 15 mm. longa, apice non rostrata. *Legumen* subsessile, 4–5 cm. longum, oblongo-cylindricum, multispermum, glabrum.

ABYSSINIA : Dschan Meda, *Schimper* (1863–68) No. 1533 ! *Schimper* (1844) No. 1894 ! Memsach, *Schimper* (1842) No. 1083 ! *Quartin Dillon* ! Hb. Paris ; *Schimper* (1863–68) W. Gaffah, No. 1282 ! Hb. Mus. Brit.

UGANDA : Mabira Forest, *Brown* No. 458 ! Hb. Mus. Brit.

CONGO REGION : Katanga, *Ringoet* No. 420 ! Hb. Brux. ; Katanga, *Homblé* No. 420 ! Hb. Brux.

GERMAN EAST AFRICA : Marangu, *Volkens* No. 77 ! Hb. Berol.

NYASALAND : Mt. Milanji, *Whyte* ! Hb. Mus. Brit.

PORTUGUESE EAST AFRICA : Zambesiland, *Kirk* ! *Waller* ! Hb. Kew.

GAZALAND : Chirinda, *Swynnerton* No. 365 ! Hb. Mus. Brit.

TRANSVAAL : Shilouvane, *Junod* Nos. 2252 ! 2316 ! Hb. Turic. ; Barberton, *Galpin* No. 845 ! Hb. Kew.

Subsp. C. SIMPLEX, *A. Rich. Tent. Fl. Abyss.* i. 153 (1847), pro sp.

Caulis erectus, validus, simplex, circ. 2 m. alt. attingens. *Stipulæ* angustæ, circ. 8 mm. longæ. *Folia* trifoliolata, foliolis lanceolatis vel lineari-lanceolatis acuminatis 9–22 mm. longis circ. 9–15 mm. latis vel nonnunquam latioribus, petiolo communi 4–6 mm. longo prædita. *Flores* mediocres, iis *C. rectæ*, Steud., subsimiles, in racemum elongatum multiflorum dispositi. *Bracteæ* 9–10 mm. longæ. *Bracteolæ* parvæ. *Calyx* totus circ. 11 mm. longus. *Carina* dorso rotundata, 13–15 mm. longa. *Legumen* stipitatum, stipite excluso circ. 5 cm. longum, demum glabrum.

ABYSSINIA : Between Maye-Gouagoua and Debra Sina, *Quartin Dillon* ! Hb. Paris.

NYASALAND : Shire Highlands, *Buchanan* (1881) No. 533 *a* ! Blantyre, *Buchanan* (1879) No. 144 ! Hb. Kew.

"It grows to about 6 feet and is a beautiful bush when in flower."—Buchanan.

Series 27. Flores mediocres, in racemos laxos dispositi. Carina dorso rotundata, calycem subæquans. Stipulæ lineares. Hujus seriei legumina mihi cognita oblonga, breviter stipitata. Herbæ glabræ, subglabræ vel pubescentes.

190. C. GLAUCIFOLIA, *Baker in Oliver, Fl. Trop. Afr.* ii. 38 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 204.

Herbacea, erecta, 7–10 dm. alta, ramis junioribus pubescentibus adultioribus glabris. *Stipulæ* 1–2 cm. longæ. *Folia* trifoliolata, foliolis obovatis 40–60 mm. longis 25–34 mm. latis glaucis glabris, petiolo communi 30–50 mm. longo prædita. *Flores* in racemos elongatos laxos dispositi. *Bracteæ* lineares. *Calyx* subglaber, dentibus lanceolatis. *Vexillum* extus cinnamomeum, intus intense violaceo-cæruleum. *Alæ* flavæ, oblongæ, carinam paullo superantes. *Carina* sulphurea, dorso rotundata, ± 10 mm. longa. *Ovarium* breviter stipitatum, lineari-oblongum. *Legumen* immaturum oblongum.

ANGOLA : Pungo Andongo, *Welwitsch* No. 1934 ! Hb. Mus. Brit., etc.

191. C. VERSICOLOR, *Baker in Oliver, l. c.* ii. 28 (1871) ; *Hiern, Cat. Welw. Afr. Pl.* i. 200.

Herba circ. 3–6 dm. alta, e basi ramosa, ramis elongatis prostrato-adscendentibus. *Stipulæ* angustæ, lineares, 5–7 mm. longæ. *Folia* trifoliolata, foliolis obovato-oblongis 4–7 cm. longis 2·5–3 cm. latis crassiusculo-carnosis viridibus subtus griseo-pubescentibus, petiolo communi 7–21 mm.

longo suffulta. *Flores* mediocres, in racemos laxos dispositi. *Bracteæ* lineares. *Calyx* griseo-sericeus, 13–15 mm. longus; laciniæ quam tubus longiores. *Vexillum* extus cupreo-rubrum, intus violaceo-cæruleum. *Alæ* oblongæ. *Carina* calyce brevior, dorso rotundata, circ. 10 mm. longa. *Legumen* stipitatum, pubescens, 8–12-spermum.

ANGOLA: Pungo Andongo, *Welwitsch* No. 1979! Hb. Mus. Brit.

Var. nov. CAMERUNENSIS, *Bak. fil.*

Herba 0·8–1 m. alt. *Foliola* elliptica vel elliptico-oblonga, 8–10 cm. longa, 3–3·5 cm. lata, apice subacuta, petiolo communi 20–55 mm. longo suffulta. *Flores* mediocres, in racemos laxos dispositi. *Calyx* 14–15 mm. longus. *Vexillum* suborbiculari-obovatum, unguiculatum. *Carina* dorso rotundata, 13–14 mm. longa. *Legumen* deest.

CAMEROONS: Sambulabo, 1160 m., *C. Ledermann* No. 5513! Hb. Berol.

Standard rusty brown above, carina and wings golden green. In flower Oct. 8, 1909.

Differs from the type in the longer, rather differently shaped leaflets and the generally longer petiole. Bracteoles small linear.

192. C. LOTONONIS, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 39 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 204.

Habitu *Lotononidis*. *Herbacea* diffusa, copiose ramosa, 0·3 m. alt. vel ultra. *Stipulæ* 6–12 mm. longæ, setaceæ. *Folia* trifoliolata, foliolis glabris oblongis vel lanceolatis 35–42 mm. longis supremis 6–9 mm. latis, inferioribus latioribus 12 mm. latis, petiolo communi 18–30 mm. longo suffulta. *Flores* in racemos laxos usque ad 12–18-floros dispositi. *Bracteæ* circ. 3 mm. longæ. *Pedicelli* 3–4 mm. longi. *Calyx* circ. 9 mm. longus, dentibus lanceolatis tubo longioribus. *Corolla* glabra, calycem subæquans. *Ovarium* breviter stipitatum, lineare, glabrum, ovulis circ. 20. *Legumen* ignotum.

ANGOLA: Pungo Andongo, *Welwitsch* No. 1969! Hb. Mus. Brit.

A plant with the habit of a *Lotononis*. The leaflets are glabrous and lanceolate, the racemes lax and 12–18-flowered. There is only a tracing of this plant at South Kensington.

193. C. LONGIFOLIOLATA, *De Wild. in Ann. Mus. Congo, Bot.*, sér. IV. i. (1903) tab. 45. figs. 1–10.

Frutex. *Stipulæ* lineares, setaceæ, 17–19 mm. longæ. *Folia* trifoliolata, foliolis longe lanceolatis lateralibus 8·5–11·5 cm. longis 12–14 mm. latis, petiolo communi 3·5–5 cm. longo suffulta. *Flores* numerosi, in racemos dispositi. *Calycis* tubus brevis; laciniæ lanceolatæ, tubo longiores. *Bracteæ* ad basin pedicelli, angustæ. *Vexillum* violaceum, suborbiculari-obovatum,

unguiculatum, 12–13 mm. longum, 10 mm. latum. *Carina* dorso rotundata. *Legumen* oblongum vel obovale, stipitatum, 4·5 cm. longum, extus velutinum, multispermum.

CONGO REGION : Lukafu, *Verdick* No. 362 ! Hb. Brux.

Var. nov. LATIOR, *Bak. fil.*

Erecta, caule strigoso-pubescente. *Stipulæ* lineares, 9–12 mm. longæ. *Folia* trifoliolata, foliorum supremorum foliolis lanceolatis 12–13 cm. longis lateralibus paullo minoribus 20–35 mm. latis, inferiorum foliolis ellipticis vel ovatis quam superiorum foliolis brevioribus et latioribus 6–7 cm. longis 30–35 mm. latis, petiolo communi 40–52 mm. longo suffulta. *Racemi* elongati, circ. 25 cm. longi, laxe floriferi. *Vexillum* profunde cæruleum, cum ungue 14–15 mm. longum. *Carina* dorso rotundata, 10–11 mm. longa. *Legumen* oblongum, inflatum, cum stipite 50–55 mm. longum.

CONGO REGION : Eville, *Homblé* No. 215 ! Hb. Brux. ; Katanga, Shiusenda, *Homblé* No. 503 ! Hb. Brux.

The upper leaflets are lanceolate, the lower leaflets elliptical or ovate, the raceme is long, and loosely many-flowered, often 18–20-flowered, and the carina is rounded and 10–11 mm. long.

194. C. CYANEA, *Baker in Oliver, Fl. Trop. Afr.* ii. 39 (1871) ; *Hiern, Cat. Welw. Afr. Pl.* i. 204.

Annua. Caulis tenuis, filiformis, pubescens. *Stipulæ* lineares. *Folia* trifoliolata, foliolis ovatis vel oblongo-lanceolatis 15–40 mm. longis 7–17 mm. latis subtus pubescentibus, petiolo communi pubescente 20–35 mm. longo suffulta. *Flores* mediocres, in racemos laterales laxissimos paucifloros dispositi. *Bracteæ* angustæ. *Calycis* tubus brevis ; laciniæ lanceolatæ in toto 8–9 mm. longus. *Corolla* albido-virescens. *Vexillum* cyaneum. *Alæ* oblongæ. *Carina* dorso rotundata, 7–9 mm. longa. *Legumen* oblongum, cum stipite circ. 3 cm. longum, pubescens.

ANGOLA : Huilla, *Welwitsch* No. 1952 ! Hb. Mus. Brit.

Series 28. Flores mediocres, in racemos paucifloros laxos dispositi. Carina dorso rotundata, 11–14 mm. longa. Stipulæ acutæ, mox deciduæ. Legumen oblongum, brevissime stipitatum, dense ferrugineo-tomentosum. Suffrutex erectus.

195. C. AMŒNA, *Welw. ex Baker in Oliver, l. c.* ii. 26 (1871) ; *Hiern, Cat. Welw. Afr. Pl.* i. 200.

Suffrutex 0·5–1·3 m. altus. *Caules* superne plus minusve cinereo-tomentosi. *Folia* trifoliolata, coriacea, foliolis oblongis vel ellipticis 22–45 mm. longis 9–18 mm. latis superne præter costam nitidis subtus pubescentibus, petiolo communi 1–2 mm. longo suffulta. *Flores* in racemos 2–6-floros

dispositi. *Bracteæ* lanceolatæ. *Bracteolæ* lineares. *Calycis tubus* campanulatus, lobis lanceolatis acutis tubo longioribus. *Vexillum* tomentosum. *Alæ* carina breviores. *Carina* uncinata, apice incurva. *Legumen* 20–35 mm. longum, leguminis stipes calyce brevior.

CONGO REGION: Kundelungu, *Kässner* No. 2573! Hb. Mus. Brit., etc.

ANGOLA: Huilla, *Welwitsch* No. 1924! Hb. Mus. Brit.; *Antunes & Dekindt* No. 3184! Hb. Mus. Paris; left bank of the Luassingua, *Gossweiler* No. 2970! Hb. Mus. Brit.

NORTHERN RHODESIA: Kambola, *W. H. Nutt*! Hb. Kew.

Series 29. Flores mediocres, in racemos laxos paucifloros dispositi. Carina dorso rotundata vel leviter curvata, 9–12 mm. longa. Stipulæ parvæ vel obsoletæ. Legumina clavato-oblonga vel oviformia, stipitata.

196. C. DONIANA, *Baker in Oliver, Fl. Trop. Afr.* ii. 28 (1871).

Herbacea, adscendens. *Caulis* teres. *Folia* trifoliolata, foliolis ovatis vel ellipticis apice acutis 25–60 mm. longis 18–30 mm. latis subtus strigoso-pubescentibus, petiolo communi pubescente 20–35 mm. longo prædita. *Flores* mediocres, in racemos laterales dispositi. *Bracteæ* lineares. *Calycis tubus* brevis, laciniæ lanceolatæ. *Vexillum* luteum. *Alæ* oblongæ. *Carina* apice acuta, 10–12 mm. longa. *Legumen* cum stipite circ. 30–35 mm. longum.

SIERRA LEONE: *G. Don*! Hb. Mus. Brit.

NIGERIA: *P. Talbot*! Hb. Mus. Brit.

CAMEROONS: *Zenker* No. 1163! Hb. Berol.! Jaunde, *Zenker & Staudt* No. 576! Hb. Berol.; *Winkler* No. 1030! Hb. Berol.

CONGO REGION: Bwado, *Sapin*! Hb. Brux.

This is the *Crotalaria* No. 10 Hook. fil. & Benth. Niger Fl. p. 292.

197. C. BARNABASSII, *Dinter in Herb. Turic.*

Caulis erectus, circ. 1 m. alt., ramosus glaucescens. *Stipulæ* parvæ vel obsoletæ. *Folia* trifoliolata, foliolis glauco-viridibus oblongo-lanceolatis petiolulatis 20–50 mm. longis 4–8 mm. latis, petiolo communi 20–35 mm. longo prædita. *Flores* aureo-flavi, mediocres, in racemos laxos dispositi. *Bracteæ* ad basin pedicelli lineares. *Calyx* totus circ. 7 mm. longus. *Vexillum* cuneato-obovatum. *Alæ* oblongæ, carina breviores. *Carina* dorso rotundata, falcata, apice acuta, 10–11 mm. longa. *Legumen* oviforme, cum stipite 25–32 mm. longum, 8–12-spermum, stipes circ. 10 mm. longus.

RHODESIA: Victoria Falls, *Rogers*! Hb. Mus. Brit.

DAMARALAND: Okahandja, *Dinter* No. 490! Hb. Turic.

HEREROLAND: Spitzkoppjes, *Dinter* No. 63! Hb. Turic.

Noticeable on account of the glaucous-green, oblong-lanceolate leaflets and the oviform, long-stipitate pod.

198. C. NATALENSIS, *Bak. fil.*, sp. nov.

Caulis gracilis, filiformis, ramis novellis pubescentibus adultioribus glabris. *Stipulæ* non conspicuæ. *Folia* trifoliolata, foliolis petiolulatis membranaceis ellipticis ovatis vel oblongo-obovatis 15–33 mm. longis 7–17 mm. latis, petiolo communi 20–42 mm. longo suffulta. *Flores* lutei, in racemos axillares et oppositifolios paucifloros dispositi. *Pedicelli* medio bibracteolati, bracteolis minutis. *Calyx* pubescens, dentibus lanceolatis. *Vexillum* luteum, 9–10 mm. longum. *Carina* dorso angulo recto curvata, in toto 9–10 mm. longa. *Legumina* oblongo-clavata, basi in stipitem brevem attenuata, cum stipite 28–32 mm. longa, extus pubescentia, pedicellis fructiferis 5–7 mm. longis.

NATAL: Umzumbi, edge of bush, *J. M. Wood* No. 3009! Hb. Kew. In flower April 24.

Noticeable on account of the slender stem, trifoliolate leaves, few-flowered raceme, and oblong-clavate pods which are shortly stipitate. Allied to *C. Doniana*, Baker.

Series 30. Flores mediocres, in racemos laxos dispositi. Carina dorso rotundata, 12–14 mm. longa, flava. Bracteolæ ad basin calycis 2, conspicuæ, lineares. Stipulæ setaceæ. Legumen subsessile, oblongo-cylindricum, hirtum, 20–30-spermum.

199. C. INCANA, *Linn. Sp. Pl.* 716 (1753); *Bot. Reg.* t. 377; *DC. Prod.* ii. 132; *Baker in Oliver, Fl. Trop. Afr.* ii. 31; *Chiovenda in Ann. Ist. Bot. Roma*, viii. 81.

C. purpurascens, Lam. Encycl. ii. 200 (1786).

C. Schimperi, A. Rich. Tent. Fl. Abyss. i. 151 (1847).

C. montana, A. Rich. Tent. Fl. Abyss. i. 152 (1847).

Chrysocalyx Schimperi, Hochst. in Schimp. Pl. Abyss. No. 394.

Herba vel suffrutex, erectus. *Caulis* divaricatim ramosus, patentim sericeo-hirtus. *Folia* trifoliolata, foliolis obovatis basi cuneatis 20–46 mm. longis, 16–33 mm. latis superne glabrescentibus subtus sericeis, petiolo communi 15–45 mm. longo prædita. *Flores* in racemos laterales et terminales laxe 6–20-floros dispositi. *Pedicelli* breves. *Bracteæ* minutæ. *Bracteolæ* conspicuæ, 3–5 mm. longæ. *Calyx* circ. 10 mm. longus; laciniæ lanceolatæ tubo longiores. *Vexillum* calyce paullo longius, 11–13 mm. longum. *Alæ* oblongæ, unguiculatæ. *Carina* margine interiore albo-lanata, apicem versus in rostrum sensim attenuata, cum unguibus 12–14 mm. longa.

SIERRA LEONE: *G. Don*! Hb. Mus. Brit.

ABYSSINIA: *Schimper* (1853) No. 50! Hb. Kew.; Mt. Scholoda, *Schimper* (1863–68) No. 263! Hb. Mus. Brit.; *Schimper* (1840) No. 394! Hb. Mus. Brit.

ERITREA: *Schweinfurth & Riva* No. 1232! Hb. Kew.; Hamasen, *Pappi* No. 181! Hb. Mus. Brit.

UGANDA: Ruwenzori, *Scott Elliot* No. 7866! Hb. Mus. Brit.

GERMAN EAST AFRICA: Marangu, *Volkens* No. 635! Hb. Mus. Brit.; Kilimanjaro, *Volkens* No. 346! Hb. Berol.

Cosmopolitan in the Tropics, but perhaps an introduction in the Old World. This is the *Crotalaria trifolia fruticosa foliis rotundis incanis*, etc., Sloane, Jam. 141, Hist. ii. 34, t. 179. fig. 1. There is a specimen in Herb. Sloane, vol. vi. p. 6. *C. montana*, A. Rich., appears to be this plant, but the type specimen is not in good condition.

200. C. EMARGINELLA, *Vatke in Œst. Bot. Zeit.* xxviii. (1878) 199.

Frutex 0·5 m. altus; caulis a basi ramosus, inferne pilis longis albidi obsitus. *Rami* suberecti, elongati, bifariam pubero-hirti. *Stipulæ* lineares, breves, sericei. *Foliola* obovata, subemarginata, utrinque pubescentia. *Petioli* 10–25 mm. longi. *Racemi* terminales, 1–2 dm. longi, sub 10-flori. *Bracteæ* lineares. *Pedicelli* inferiores erecti, superiores cernui. *Calycis* sericei; dentes deltoidei, acuti. *Corolla* calyce duplo longior. *Vexillum* striatum. *Legumen* sessile, pubescens.

ERITREA: Habab, alt. 4000 ft., *Hildebrandt* No. 586.

I have had to rely on Vatke's description of this species as I have not seen an authentic specimen.

Series 31. Flores mediocres, saturate rosei in racemos laxos pluri- vel multifloros dispositi. Carina falcata, 13–15 mm. longa, rostro nullo. Stipulæ subulatæ, vel obsoletæ. Legumen glabrum, stipitatum, oblongum. Frutex erectus.

201. C. PURPUREA, *Vent. Jard. Malm.* t. 66 (1804); *Bot. Reg.* t. 128; *Bot. Mag.* t. 1913; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 46.

C. elegans, Hort. ex DC. Prod. ii. 134 (1825).

Frutex vel arbuscula 1–4 m. altus, valde ramosus. *Ramuli* adpresse pubescentes. *Folia* trifoliolata, per somnum deflexa, foliolis ellipticis vel obovatis 18–35 mm. longis 10–16 mm. latis glabris vel minute canescentibus, petiolo communi 10–15 mm. longo suffulta, petiolulis 1–2 mm. longis. *Corolla* purpurea. *Bracteæ* ad basin pedicelli parvæ. *Bracteolæ* lineares. *Calyx* totus circ. 5–6 mm. longus, lobis inferioribus triangularibus lobis 2 superioribus truncatis. *Vexillum* calyce 2–3-plo longius. *Alæ* oblongæ. *Carina* falcata, 11–15 mm. longa. *Legumen* turgidum, transverse venosum, cum stipite 25–35 mm. longum.

CAPE: In moist subalpine places from Caledon to Uitenhage. George, *Drege*, Hb. Kew.; Gnadendahl, *Dr. Prior*! *Drege*! Hb. Mus. Brit.; Zwarteberg, *Pappe*! *Bowie*! Hb. Mus. Brit.; Knysna District, Esternek, *Rehmann* No. 490! Hb. Turic.; Knysna, *Tyson* No. 982! Hb. Kew.; Garcias Pass, *E. Phillips* No. 349! Hb. Kew.; South Africa, *Ecklon & Zeyher*! Hb. Turic. *Burchell* No. 5792! *Auge*!

There is a specimen in Hb. Brit. Mus. from Hort. Kew. 1793.

This is a very curious species on account of the purple flowers and the absence of a rostrum to the carina.

C. coluteoides, Lam. Encyl. ii. 200, is perhaps this species, but the petals are not known.

Series 32. Flores mediocres vel majusculi in racemos paucifloros vel plurifloros dispositi. Carina dorso rotundata, 10–15 mm. longa. Stipulæ parvæ. Legumina oviformia vel oblonga, sessilia vel brevissime stipitata. Frutices vel suffrutices.

202. C. COLORATA, *Schinz in Mém. Herb. Boiss.* No. 1, 127 (1900).

Radix lignosa, flava. *Fruticulus* ramulis sericeis. *Stipulæ* parvæ. *Folia* trifoliolata, cinereo-sericea, foliolis cuneato-obovatis 15–25 mm. longis, petiolo communi 10–17 mm. longo prædita. *Flores* aureo-flavi, mediocres, in racemos paucifloros vel plurifloros dispositi. *Bracteæ* angustæ. *Calyx* sericeus, 10–12 mm. longus. *Vexillum* unguiculatum. *Alæ* latæ, unguiculatæ, ±11 mm. longæ, 6–7 mm. latæ. *Carina* apice in rostrum acutum attenuata, circ. 11 mm. longa. *Legumen* oviforme vel oblongum, 18–25 mm. longum, sessile, cinereo-sericeum.

HEREROLAND: Swakopmund, *Dinter* No. 206! Hb. Berol.; Tsoaxaub Munding, *Dinter* No. 48! Hb. Turic.; *Dinter* No. 1! Hb. Turic.

Flowers golden yellow.

203. C. ERECTA, *Schinz in Herb. Schinz.*

C. mollis, E. Meyer, var. *erecta*, Schinz in Abhandl. Bot. Ver. Prov. Brand. xxx. (1888) 161.

Frutex vel suffrutex erectus, sericeo-hirtus vel hispidus. *Stipulæ* angustæ. *Folia* trifoliolata, foliolis cuneato-obovatis 22–30 mm. longis 15–20 mm. latis sericeo-tomentosis, petiolo 10–15 mm. longo suffulta. *Flores* mediocres, in racemos dispositi. *Bracteæ* angustæ. *Calyx* hirtus, 10–11 mm. longus. *Vexillum* suborbiculari-obovatum. *Carina* calyce paullo longior, ±12 mm. longa, apice rostrata. *Legumen* oviforme, subsessile vel breviter stipitatum, cum stipite 25–30 mm. longum.

GREAT NAMAQUALAND: Near Klein Fontain, *Schinz*! near Angra Pequena, *Schenck* No. 1!; Kolmankop, *Range* No. 599! Hb. Berol.; Namib, *Dr. Schäfer* No. 1268! Hb. Berol.; Namib, *Dinter* No. 1033! Hb. Berol.; Warmbad! *Marloth* No. 4780! Hb. Berol.; Namib, near Angra Pequena, *Schultze* No. 104! Hb. Berol.

204. C. MOLLIS, *E. Mey. Comm.* 23 (1835); *Benth. in Hook. Lond. Journ. Bot.* ii. 575; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 42.

Diffusa e basi ramosissima, molliter hirta vel pilosa. *Radix* lignosa. *Caules* subherbacei, 10–30 cm. longi. *Stipulæ* parvæ. *Folia* trifoliolata,

foliolis obovatis 10–17 mm. longis 8–12 mm. latis supra glabriusculis subtus molliter pilosis, petiolo communi 8–17 mm. longo suffulta. *Flores* mediocres, in racemos laxe 3–6-floros dispositi, nutantes, lutei. *Bracteæ* lineares, acutæ. *Calyx* molliter pilosus ; laciniæ lanceolatæ. *Vexillum* suborbiculari-obovatum. *Alæ* carina breviores. *Carina* dorso rotundata, apice in rostrum rectiusculum attenuata, 10–12 mm. longa. *Legumen* subsessile, oblongum, valde inflatum, 15–20 mm. longum, molliter villosum.

GREAT NAMAQUALAND : Dry hills and islands at the mouth of the Gariep, *Drege* No. 3333 ! Hb. Turic., Hb. Mus. Paris; Angra Pequena, *Schenck* No. 18 ! Hb. Turic.

205. C. GRISEOFUSCA, *Bak. fil.*, sp. nov.

Frutex ramosus, usque ad 1·6 m. alt., cinereo- vel fusco-tomentosus. *Rami* erecto-patuli. *Stipulæ* lineares, ±2 mm. longæ. *Folia* trifoliolata, foliolis obovatis vel ellipticis basi cuneatis apice leviter emarginatis lateralibus 10–25 mm. longis 8–20 mm. latis, intermediis majoribus 30–50 mm. longis 13–23 mm. latis, petiolo communi sæpissime 2–5 mm. longo rarius usque ad 16 mm. longo suffulta. *Racemi* sæpissime 4–8-flori, ad apices ramorum dispositi. *Bracteæ bracteolæque* lineares. *Pedicelli* breves, sæpissime circ. 5 mm. longi. *Calyx* griseo-tomentosus, in toto circ. 10 mm. longus ; laciniæ lanceolatæ, ±6 mm. longæ, tubo paullo longiores. *Vexillum* extus cano-sericeum, obovatum, circ. 15 mm. longum. *Alæ* oblongæ, cum ungue circ. 15 mm. longæ. *Carina* dorso rotundata, naviculariformis, extus cano-tomentosa, circ. 15 mm. longa, apice acuta. *Legumen* immaturum, oblongum, breviter stipitatum, cum stipite circ. 23 mm. longum, extus cano-sericeo-tomentosum.

ANGOLA : On short shrub-grown pasturage by the Lassingua. Longa, *Gossweiler* No. 3899 ! Hb. Mus. Brit. In flower 13 Feb. 1906.

The noticeable features of this shrub are :—The trifoliolate shortly petiolate leaves, with obovate or obovate-oblong leaflets ; the numerous racemes of flowers at the ends of the branches, the racemes being 4–8-flowered ; the boat-shaped carina 14–15 mm. long, hairy externally ; the oblong, hairy, shortly stipitate pod.

Rootstock cæspitose perennial, stems numerous, erect, up to 5 feet high, leaves glaucous-green, corolla yellow, calyx herb-green.—J. Gossweiler.

Series 33. Flores mediocres, apicem versus pedunculorum dispositi. Pedunculi 2–5-flori. Carina dorso rotundata, 8–12 mm. longa. Stipulæ lineari-lanceolatæ. Legumina oblonga, subsessilia, hispida.

206. C. OBSCURA, *DC. Prod.* ii. (1825) 134 ; *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 575 ; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 42.
C. pilosa, Thunb. Fl. Cap. 572 (1823), *non* Mill.

Suffrutex decumbens vel diffusus, e basi ramosus, pilis longis patentibus rufo-hispidus. *Folia* trifoliolata, foliolis late obovatis 10–20 mm. longis 6–12 mm. latis subtus vel utrinque longe pilosus, petiolo communi 10–25 mm. longo suffulta. *Pedunculi* terminales vel oppositifolii, 8–20 cm. longi. *Bracteæ* angustæ. *Bracteolæ* ad basin calycis lanceolatæ. *Calyx* piloso-hispidus, 10–11 mm. longus; laciniæ lanceolatæ, acutæ. *Vexillum* carinæ subæquilongum. *Alæ* carina breviores. *Carina* dorso rotundata, 8–12 mm. longa, uncinata. *Legumen* usque ad 35–40 mm. longum, basi attenuatum.

CAPE: Eastern Districts and Kaffraria. Grassy pastures in the Uitenhage District and from there to the Omsamwubo in Kaffirland, *Drege*, *Ecklon & Zeyher* No. 1260! Hb. Schinz and others. Near Saladkraal, *Burke*, Zuurveld, *Dr. Gill*! Hb. Schinz; East London, *A. Seifert* No. 118! Hb. Turic.; King Williamstown, *Schlechter* No. 6124! Hb. Turic.; East Griqualand, Kokstad, *Tyson* No. 1885! Hb. Schinz; District of Beaufort, *Cooper* No. 252! Hb. Schinz; Transkei, Bazuja, *Baur* No. 588! Hb. Schinz; Cypherfontein, near Grahamstown, *S. Schönland* No. 830! Hb. Schinz; near Grahamstown, *P. Macowan* No. 465! Hb. Mus. Brit.; on the Quagga Flats, *Bowie*! Hb. Mus. Brit.

Series 34. Flores mediocres, in racemos multifloros dispositi. Carina dorso rotundata, 9–12 mm. longa. Legumen (*C. Deflersii*, Schweinf.) clavato-cylindricum, basi sensim constrictum, stipitatum. Suffrutices erecti, ubique præter petala tomentosi.

207. C. DEFLERSII, *Schweinfurth in Bull. Herb. Boiss.* iv. App. ii. (1896) 224; *Chiovenda in Ann. Ist. Bot. Roma*, viii. (1908) 80.

C. senegalensis, A. Terraciano, Fl. Anfilha 22, *non* Bacle.

C. clavata, Wight & Arn. sec. Deflers, Voy. Yem. 127.

Suffruticosa elata, ubique tenuiter petalis exceptis canescenti-tomentosa. *Stipulæ* inconspicuæ vel nullæ. *Folia* trifoliolata, foliolis juventate albo-sericeis postea canescentibus ovalibus vel orbiculari-obovatis 3·5–4 cm. longis 2–3 cm. latis, petiolo communi 4·5–6 cm. longo suffulta. *Racemi* laterales vel pseudo-terminales, elongati, multiflori. *Bracteæ bracteolæque* lineari-setaceæ. *Calyx* ± 11 mm. longus, ad $\frac{2}{3}$ partitus. *Vexillum* orbiculare, circ. 12 mm. longum. *Alæ* oblongo-ovatæ. *Carina* dorso semiorbicularis. *Legumen* deflexum, ad 15-spermum, cum stipite circ. 40 mm. longum.

ERITREA: Damoeita, *Terraciano* No. 1750; Achil Island, *Terraciano* No. 1749; Midir Island, *Terraciano* No. 1748, Hb. Rom.; Assaorta, *Pappi* No. 109, Hb. Rom. *fide* Dr. Chiovenda.

The type was described from Yemen, and the above description is from Arabian specimens.

208. C. TRIFOLIOLATA, *Bak. fil. in Journ. Bot.* xxxiv. (1896) 53.

Suffrutex ad *C. Deflersii*, Schweinf., accedens. *Folia* trifoliolata, foliolis late obovatis vel orbiculari-obovatis basi cuneatis apice rotundatis vel leviter emarginatis 25–35 mm. longis 20–30 mm. latis, utrinque tomentosis subtus pallidioribus, petiolo communi ferrugineo-tomentoso suffulta. *Flores* inter mediocres generis, in racemos axillares et terminales dispositi. *Racemi* multiflori, apice plus minusve congesti, inferne dissiti ; flores brevissime pedicellati. *Bracteæ* lineari-lanceolatæ, 3–5 mm. longæ. *Calyx* extus tomentosus, dentibus triangularibus, vel lanceolatis. *Vexillum* circ. 10 mm. longum, late obovatum. *Carina* 10–11 mm. longum. *Legumen* deest.

GALLA HIGHLANDS : Walenso, *Donaldson Smith* No. 213 ! Hb. Mus. Brit.

This plant is ferrugineous-tomentose while *C. Deflersii* is cinereous-tomentose. The pods in *C. Deflersii* are cylindrical-clavate.

Series 35. Flores splendide lutei, mediocres, in racemos longe pedunculatos densiusculos 6–12-floros dispositi. Carina 12–13 mm. longa. Ovarium lineari-oblongum. Caules suffruticosi, procumbentes.

209. C. PROTENSA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 35 (1875) ; *Hiern, Cat. Welw. Afr. Pl.* i. 203.

Caules 0·6–1·3 m. longi, griseo-sericei. *Stipulæ* setaceæ. *Folia* trifoliolata, foliolis oblongo-lanceolatis acutis 5–7 cm. longis 16–24 mm. latis subcoriaceis superne glabris subtus pilis griseis obtectis, petiolo communi 12–18 mm. longo suffulta. *Bracteæ* lineares, 4–6 mm. longæ. *Calyx* 10 mm. longus, coriaceus, griseo-sericeus, dentibus lanceolatis. *Corolla* lutea, calycem paullo superans. *Carina* dorso rotundata, uncinata. *Legumen* ignotum.

ANGOLA : Pungo Andongo, *Welwitsch* No. 1929 ! Hb. Mus. Brit.

Allied to *C. decumbens*, Welw., but the stipules are quite different.

Subsect. 3. PARVIFLORÆ.

Stipulæ parvæ vel angustæ vel obsoletæ. Flores parvi vel parviusculi, in racemos dispositi. Carina sæpius 4–10 mm. longa *.

CLAVIS SPECIERUM.

1.	Herbæ suffrutices vel fruticuli, foliis 3-foliolatis	2
	Frutex, foliis 4–5-foiiolatis	*Saharæ.*
2.	Flores in racemos non subumbellatim dispositi	3
	Flores ad apicem pedunculorum umbellatim vel subumbellatim disposit	38
3.	Carina dorso rotundata	4
	Carina dorso angulo recto vel fere recto curvata, inde in rostrum rectum sensim attenuata	35

* See note on page 314, which also applies here.

4.	Racemi laxi	5
	Racemi densi, vel densiusculi............................	20
5.	Calycis lobi foliacei	*platycalyx.*
	Calycis lobi non foliacei	6
6.	Carina 5–8 mm. longa	7
	Carina 9–10 mm. longa	15
7.	Herbæ vel suffrutices, foliis petiolatis	8
	Suffrutices virgati, valde foliosi, foliis sessilibus vel subsessilibus.	19
8.	Bracteæ cordato-ovatæ	*orixensis.*
	Bracteæ non cordato-ovatæ	9
9.	Racemi pauciflorae	10
	Racemi multifloræ	13
10.	Legumina stipitata	11
	Legumina sessilia vel subsessilia	12
11 (*a*)	Foliola lanceolata vel ovata. Legumen cum stipite 25–30 mm. longum	*cyanea* (p. 387).
(*b*)	Foliola linearia vel lineari-lanceolata. Legumen cum stipite 20–22 mm. longum	*glaucoides* (p. 393).
(*c*)	Foliola oblonga vel oblongo-oblanceolata. Legumen cum stipite 16–20 mm. longum	*Loandæ* (p. 393).
12 (*a*)	Foliola elliptica vel obovata. Legumen oblongo-oviforme	*distantiflora.*
(*b*)	Foliola oblonga vel oblongo-elliptica. Legumen oviforme	*Preladoi.*
(*c*)	Foliola oblongo-elliptica vel elliptica. Legumen oviforme vel globosa oviforme. Carina naviculariformis	*hispida.*
(*d*)	Foliola glauco-viridia, oblongo-linearia. Legumen subsphæricum vel ovale. Carina uncinata	*Steudneri.*
(*e*)	Foliola anguste oblonga. Legumen ferrugineo-sericeum, oblongo oviforme, calcyem 2-plo superans. Carina subuncinata.	*massaiensis.*
(*f*)	Foliola oblanceolata. Legumen pilosum, oblongum, calycem 4-plo superans	*orthoclada.*
(*g*)	Foliola cuneato-obovata, vel cuneato-elliptica. Legumen oblongum, calycem 4–5-plo superans........................	[*Onobrychis.* *astragalina* subsp.
13.	Racemorum pars florifera longa	14
	Racemorum pars florifera brevis	*oligostachys.*
14.	Foliola lanceolato-oblonga. Herbacea, diffusa	*uncinata.*
	Foliola lanceolata. Erecta................................	*lanceolata* (p. 343).
15.	Foliola glabra vel in pagina inferiore puberula	16
	Foliola in pagina inferiore pubescentia, pilosa vel tomentosa ..	18
16.	Foliola coriacea. Fruticulus humilis. Verisimiliter hujus seriei.	*aspalathoides.*
	Foliola non coriacea......................................	17
17.	Foliola anguste oblonga. Legumen stipitatum, oviforme	***Barnabassii*** [(p. 356).
	Foliola oblonga vel oblanceolata. Legumen sessile, cylindricum	*cylindrica.*
18 (*a*)	Foliola obovata vel orbiculari-obovata. Planta somalensis	*Phillipsiæ.*
(*b*)	Foliola lanceolata vel oblonga, pilosa. Planta Africa orientalis .	*ukambensis.*
(*c*)	Foliola obovata, pubescentia. Planta Africa austro-orientalis ..	*Schlechteri.*
(*d*)	Foliola obovata, dense tomentosa. Planta intertropicalis	*uguenensis.*
(*e*)	Foliola obovata oblongo-obovata vel ovata. Planta transvaalensis...	*Schinzii.*
19.	Foliola sessilia, oblanceolato-linearia. Suffrutex usque ad 6 dm. alt.	*sessilis.*

Foliola sessilia, foliolis oblanceolatis vel oblongo-oblanceolatis. Suffrutex 6–9 dm., caulis apice caudato .... *caudata.*

20 (*a*) Herbæ vel rarius suffrutices, humiles vel mediocriter elati. Flores in racemos densos vel subdensos et breves vel in capitula dispositi. Legumina oblonga, vel lineari-oblonga (hujus seriei mihi cognita) 21

(*b*) Herbæ elatæ, 6–15 dm. altæ. Flores in racemos plus minus elongatos dispositi. Legumina oblonga, depresso 30

(*c*) Herbæ vel suffrutices, subelati. Flores in capitula dispositi. Legumina mihi cognita oviformia vel globoso-oviformia, pilis dense obtecta 33

21. Flores parvi. Carina sæpius 4–6 mm. longa 22

Flores majores. Carina sæpius 7–10, rarius 11 mm. longa 25

22. Carina eleganter purpureo- vel violaceo- vel brunneo-striata.... 23

Carina lutea 24

23. Foliola elliptico-oblonga. Racemi densi .... *vallicola.*

Foliola cuneato-oblonga, vel cuneato-elliptica. Racemi breves densi .... *astragalina.*

Foliola lineari-lanceolata. Racemi breves, densi .... *brachycephala.*

Foliola obovata vel elliptico-obovata. Racemi subdensi ...... *chrysochlora.*

24. Foliola cuneato-oblonga. Folia ad flores approximata .... *pycnostachya.*

Foliola oblonga. Folia ab floribus distantia .... *utschungwensis.*

25. Foliola angusta vel angustissima sæpius 1–3 mm. lata 26

Foliola latiora 27

26. Foliola lineari-ligulata. Planta abyssinica .... *Plowdeni.*

Foliola linearia. Racemi subdensi. Planta occidentalis ...... *lathyroides.*

Foliola lanceolata. Racemi densi. Planta congoensis .... *lukafuensis.*

27. Carina intense colorata, rubro-purpurea .... *emarginata.*

Carina lineis violaceis vel purpureis eleganter notata 28

Carina flava 29

28. Foliola elliptica, vel oblongo-elliptica, 10–15 mm. longa. Carina 7–8 mm. longa .... *mesopontica.*

Foliola oblonga, vel elliptica, 15–55 mm. longa. Carina 8–9 mm. longa .... *Chirindæ.*

Foliola ovali-lanceolata. Carina circ. 10 mm. longa .... *subcapitata.*

29. Foliola oblongo-obovata vel elliptica. Petioli 2–5 mm. longi .. *pycnocephala.*

Foliola oblongo-elliptica. Petioli 15–28 mm. longi .... *Muansæ.*

Foliola oblongo-elliptica, glauco-viridia. Petioli 3–6 mm. longi . *fwamboensis.*

Species verisimiliter hujus seriei sed mihi non satis nota. Foliola oblongo-linearia. Vexillum aurantiacum .... *Tropeæ.*

30. Petala lutea .... *Oreadum* (p. 348).

Petala eleganter lineata 31

31. Carina 6–8 mm. longa 32

Carina 9–10 mm. longa. Foliola linearia vel elliptica .... *Dilloniana.*

32. Foliola angusta, linearia, oblanceolato-oblonga, vel elliptica. Legumen lineari-oblongum, 12–15 mm. longum, 12–17-spermum .... *comosa.*

Foliola oblonga vel elliptica. Legumen circ. 17 mm. longum, hirtum circ. 18-spermum .... *Vatkeana.*

33. Capitula densissima, multiflora .... *densicephala.*

Capitula minora, pluriflora 34

34.	Foliola oblonga vel obovato-oblonga........................	*dumetorum.*
	Foliola obovata vel oblongo-obovata	*lachnoclada.*
35.	Carina circ. 5 mm. longa. Racemi ±8-flori	*Paulitschkei.*
	Carina 9–10 mm. longa	36
36.	Legumen oviforme, stipitatum. Racemi 15–20-flori	*Jerokoensis.*
	Legumen oblongo-clavatum	37
37.	Foliola obovata	*laxa.*
	Foliola oblonga	*deserticola.*
38.	Carina 4–5 mm. longa. Herba 8–10 cm. alta................	*sertulifera.*
	Carina circ. 10 mm. longa. Perennis erecta, ramosa..........	*argyrolobioides.*

Series 36. Flores mediocres, in racemos axillares dispositi. Carina dorso rotundata, ±9 mm. longa. Stipulæ parvæ. Legumen oblongum, subsessile, circ. 25 mm. longum. Suffrutex ramosus.

210. C. SCHLECHTERI, *Bak. fil.*, sp. nov.

Suffrutex erectus, ramis cinereo-pubescentibus. *Folia* trifoliolata, foliolis obovatis apice mucronatis 20–30 mm. longis 10–16 mm. latis, petiolo communi 6–8 mm. longo suffulta. *Flores* cernui, in racemos laxos dispositi. *Bracteolæ* ad basin calycis positæ. *Pedicelli* graciles. *Calyx* totus 5–6 mm. longus, dentibus triangularibus. *Vexillum* in sicco pallide luteum, 8–9 mm. longum. *Carina* vexillo subæquilonga.—Species ad *C. striatam*, DC., accedens abs qua facile distinguenda floribus minoribus.

PORTUGUESE EAST AFRICA : Incanhini, *R. Schlechter* No. 12037 ! Hb. Mus. Brit. In flower and fruit, 15 Jan. 1898.

The distinguishing features of this plant are :—The obovate leaflets, the lax racemes of cernuous flowers, the light yellow petals, the carina rounded on the back about 9 mm. long, the oblong, subsessile pod.

Series 37. Flores mediocres, in racemos laxos pauciflores laterales dispositi. Carina 8–11 mm. longa. Stipulæ setaceæ, persistentes. Calycis lobi foliacei. Legumen oblongo-cylindricum, stipitatum, glabrum, multispermum.

211. C. PLATYCALYX, *Steud. in Schimp. Herb. Abyss.* No. 860 ; *Baker in Oliver, Fl. Trop. Afr.* ii. 42 (1871) ; *Schweinfurth in Bull. Herb. Boiss.* (1896) App. ii. 226 ; *Chiovenda in Ann. Ist. Bot. Roma,* viii. (1908) 82 & 398.

Phyllocalyx Quartinianus, A. Rich. Tent. Fl. Abyss. i. 160, t. 34 (1847).

Caulis erectus, circ. 6 dm. altus, sursum tenuiter sericeus. *Folia* trifoliolata, foliolis ellipticis ovato-ellipticis vel oblongo-ellipticis 5–8 cm. longis 15–32 mm. latis, petiolo communi 5–6 cm. longo suffulta. *Flores* lutei. *Pedicelli* graciles. *Bracteolæ* ovatæ, conspicuæ, infra calycem positæ,

9–10 mm. longæ, 5 mm. latæ. *Bracteæ* ad basin pedicelli, ovatæ. *Calyx* extus tenuiter pubescens, ad ¾ partitus; laciniæ foliaceæ, supremæ quam aliæ latiore. *Vexillum* dorso pallide brunneum; carina 7–11 mm. longum. *Legumen* cum stipite 30–40 mm. longum.

ABYSSINIA: Mt. Aber, *Schimper* (1840) No. 860! Hb. Kew.; *Schimper* (1863–68) Tigré, No. 448! Hb. Mus. Brit.

ERITREA: Ambelaco, *Schweinfurth* No. 275! (1894), Geleb, *Schweinfurth* Nos. 1142! 1557! (1891), Amba, *Schweinfurth* No. 1372! (1891), Hb. Berol.; Mensa, *Terraciano & Pappi* No. 917! Ham-ham, *Terraciano & Pappi* No. 711! Hb. Rom.; Hamasen, *Ragazzi* No. 203! Hb. Rom.; Mensa, *Terraciano & Pappi* No. 1933! Hb. Rom.; Amasen, *Pappi* No. 5334! Hb. Rom.

The vexillum is light brown on the back, on the other side pale gold. The wings are yolk-coloured, the keel pale citron-gold, with black veins or greenish, the pod, without stipe, 25–28 mm. long.

Series 38. Flores parvi, graciliter pedicellati. Carina 5–6 mm. longa. Stipulæ lineari-lanceolatæ. Legumen oblongo-oviforme, stipitatum, glabrum. Annua diffusa.

212. C. ORIXENSIS, *Willd. in Ges. Naturf. Fr. Neue Schr.* iv. (1803) 217; *DC. Prod.* ii. 131; *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 588; *Baker in Oliver, Fl. Trop. Afr.* ii. 27.

C. macropoda, Hochst. in Schimp. Herb. Abyss. No. 1611; A. Rich. Tent. Fl. Abyss. i. 157.

Caules prostrati vel suberecti, pilis longis et patentibus induti. *Stipulæ* 5–6 mm. longæ. *Folia* trifoliolata, foliolis oblongo-ellipticis vel oblongo-obovatis lateralibus inæquilateralibus 15–28 mm. longis 9–14 mm. latis, petiolo communi 20–30 mm. longo prædita. *Flores* in racemos laxissimos 3–6-floros dispositi. *Pedicelli* graciles. *Bracteolæ* sub calyce retroflexæ. *Bracteæ* conspicuæ, cordato-ovatæ persistentes. *Calyx* sericeus, tubo brevi, laciniis tubo longioribus. *Corolla* calyce vix longior. *Carina* dorso genuflexa. *Legumen* cum stipite 20–22 mm. longum, stipite circ. 5–6 mm. longo.

ABYSSINIA: Prov. Sana, *Schimper* (1844) No. 1611! Hb. Mus. Brit.; *Quartin Dillon*, Hb. Mus. Paris.

A diffuse annual with conspicuous bracts, and small flowers on slender pedicels.

It was originally described in a paper entitled "Botanische Bemerkungen auf der Hin- und Rückreise von Tranquebar nach Madras," von Herrn Missionär Rottler, mit Anmerkungen von Herrn Professor C. L. Willdenow.

Series 39. Flores parviusculi, in racemos laxos dispositi. Carina dorso rotundata, 5–6 mm. longa. Stipulæ angustæ. Legumina oviformia vel oblongo-oviformia.

213. C. PRELADOI, *Bak. fil.*, sp. nov.

Annua, ramosa. *Caules* graciles. *Stipulæ* lineares, 3–5 mm. longæ. *Folia* trifoliolata, foliolis viridibus heteromorphis oblongis vel oblongo-ellipticis vel ellipticis 10–38 mm. longis 2·5–7 mm. latis, petiolo communi 8–10 mm. longo suffulta. *Bracteæ* persistentes, circ. 2 mm. longæ. *Bracteolæ* lineares, ad basin calycis adnatæ, circ. 2 mm. longæ. *Flores* parviusculi, in racemos laxos dispositi. *Racemi* axillares. *Pedicelli* graciles, 3–6 mm. longi. *Calyx* totus 4–5 mm. longus. *Vexillum* suborbiculari-obovatum, in sicco album, lineis purpureis percursum, circ. 6 mm. longum. *Alæ* oblongæ. *Legumen* oviforme, sessile, circ. 10 mm. longum, pubescens.

PORTUGUESE EAST AFRICA: Cabaceira Grande, *Prelado* No. 38! In flower 30 March, 1894. Hb. Berol.

This plant is a slender annual, with narrow stipules, the leaflets vary considerably in shape, the racemes are slender, lax, 5–8-flowered, the petals are white with purple lines, the pod is egg-shaped, sessile, pubescent.

214. C. DISTANTIFLORA, *Bak. fil.*, sp. nov.

Suffrutex ramosus. *Rami* tenues. *Stipulæ* 1·5–2 mm. longæ. *Folia* trifoliolata, foliolis ellipticis vel obovatis 15–20 mm. longis 7–10 mm. latis, petiolo communi 10–15 mm. longo suffulta. *Flores* parviusculi, in racemos laxissimos dispositi. *Racemi* distanter 2–3-flori. *Bracteæ* 1·5–2 mm. longæ. *Bracteolæ* parvæ. *Pedicelli* graciles. *Calyx* totus 4·5 mm. longus, dentibus acutis extus pubescentibus. *Vexillum* striatum, 6–7 mm. longum. *Alæ* oblongæ. *Carina* uncinata, 5–5·5 mm. longa. *Legumen* oblongo-oviforme, hirtum, 15–17 mm. longum.

GERMAN EAST AFRICA: Usambara, *Meinhof* No. 2! In flower 13 Nov. 1902. Hb. Berol.; Usambara, *Buchwald* No. 540! Hb. Mus. Brit.

The raceme of this plant is remotely 2–3-flowered, the pod hairy, oblong, egg-shaped. It is allied to *C. distans*, Benth.

Series 40. Flores parviusculi, in racemos laxos axillares 3–12-floros dispositi. Carina 5–8 mm. longa. Stipulæ angustæ. Legumina oviformia vel globoso-oviformia, sessilia. Annuæ vel perennes.

215. C. HISPIDA, *Schinz in Bull. Herb. Boiss.* sér. II. iii. (1903) 820; *Schinz in Viertelj. Nat. Ges. Zürich*, lii. (1907) 421.

Annua, procumbens, ramosa, hispida. *Stipulæ* lanceolatæ, 3–5 mm. longæ. *Folia* trifoliolata, foliolis ellipticis oblongo-ellipticis vel elliptico-lanceolatis

15–45 mm. longis 5–9 mm. latis supra glabris subtus præcipue ad nervos hispidis, petiolo communi hispide 10–15 mm. longo suffulta. *Flores* parviusculi, in racemos laxos 3–12-floros dispositi. *Racemi* 3–8 cm. longi. *Bracteæ* lineares, 1–5 mm. longæ. *Bracteolæ* parvæ, calycis tubo breviores. *Calyx* totus ± 3 mm. longus; laciniæ acutæ. *Vexillum* circ. 4 mm. longum. *Alæ* carina breviores. *Carina* 5–6 mm. longa, apice in rostrum attenuata, cymbæformis. *Legumen* oviforme vel globoso-oviforme, sessile, 8–13 mm. longum, plus minusve hirsutum, multispermum.

HEREROLAND: Omboatjipiro, *Dinter* No. 447! Hb. Turic.; Osona, *Dinter* No. 528! Hb. Turic.

A hispid annual with small flowers in lax 3–12-flowered racemes, and egg-shaped pods. Allied to *C. Steudneri*, Schweinfurth. It is quite different from *C. podocarpa* subsp. *flexuosa*, Baker, with which it has been compared.

216. C. STEUDNERI, *Schweinfurth in Verh. k.k. zool.-bot. Ges. Wien*, xviii. (1868) 651; *Baker in Oliver, Fl. Trop. Afr.* ii. 30.

Annua vel perennis. Caulis e basi ramosus, erectus, striatus, pilis patentibus hispidus. *Stipulæ* lineari-subulatæ, 3–5 mm. longæ. *Folia* trifoliolata, foliolis membranaceis glauco-viridibus supra glabris subtus ad nervos hispidis oblongo-linearibus 15–35 mm. longis 5–8 mm. latis, petiolo communi 6–8 mm. longo suffulta. *Flores* parviusculi, pallide flavi, in racemos axillares remote 5–8-floros dispositi. *Bracteolæ* minimæ. *Calyx* pedicello longior, extus puberulus, laciniis triangulari-oblongis. *Vexillum* late obovatum, nervis 12 fuscis lineatum, 6–7 mm. longum. *Alæ* vexillum æquantes. *Carina* 7–8 mm. longa, dorso angulo subacuto inflexa, calyce duplo longior. *Legumen* subsphæricum, vel ovali-globosum, sessile, 8–9 mm. longum, 10–14-spermum.

ERITREA: Bogos, Keren, *Steudner* No. 114! Hb. Berol.; *Hildebrandt* No. 572!

The plant referred here from Mkesse River, *Dr. Stuhlmann* No. 114, is doubtful; the carina is much more rounded on the back than in the type. *C. boranica*, Harms, is allied.

A plant was collected by *C. F. H. Moore* No. 1047, at Victoria, Rhodesia, which is very closely allied.

Series 41. Flores parvi, in racemos laxe pluritloros dispositi. Carina dorso rotundata, 5–6 mm. longa. Stipulæ minutæ. Legumen ferrugineo-sericeum, oblongum. Humilis.

217. C. MASSAIENSIS, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 205 (1895).

Multicaulis, radice lignosa, caulibus ramosis decumbentibus teretibus adpresse pilosis. *Stipulæ* lineari-lanceolatæ. *Folia* trifoliolata, foliolis anguste oblongis apice mucronulatis basi cuneatis supra glabris sub lente leviter

verrucosis. *Racemi* folia 2-plo superantes. *Calycis dentes* acuti, tubo fere duplo longiores. *Vexillum* calyce longius. *Ovarium* stipitatum. *Legumen* ferrugineo-sericeum, calycem duplo superans.

British East Africa : Between Teita and Wanga, *Fischer* 179 ! Hb. Berol.

The plant collected by *J. Mildbraed* in N.O. Kiwu, Lake Kalago, No. 1526, is closely allied to the above, but the flowers are larger and the racemes shorter.

Series 42. Flores mediocres vel parviusculi, in racemos laxos sæpissime 5–12-floros dispositi. Carina 6–9 mm. longa. Stipulæ parvæ. Legumina oblonga vel cylindrica, sessilia. Suffrutices virgati, sæpius elati.

218. C. sessilis, *De Wild. Ann. Mus. Congo, Bot.*, sér. v. i. (1906) 257, tab. 44.

Caulis erectus, lignosus, usque ad 60 cm. altus, valde ramosus. *Rami* virgati, tenues. *Stipulæ* parvæ, setaceæ, caducæ. *Folia* trifoliolata, sessilia, foliolis oblanceolatis linearibus, superne glabris, subtus pilis adpressis vestitis. *Flores* parviusculi, in racemos laterales 5–12-floros laxos dispositi. *Bracteæ* ad basin pedicelli, parvæ. *Bracteolæ* apicem versus pedicelli, parvæ. *Pedicelli* circ. 5 mm. longi, graciles. *Calycis laciniæ* lanceolatæ, acutæ, tubo longiores. *Vexillum* ovale, circ. 6 mm. longum. *Alæ* oblongæ, unguiculatæ. *Carina* dorso geniculata, apice subobtusa. *Legumen* circ. 14 mm. longum, subsessile, oblongum.

Congo Region : Between Dembo and Kisantu, *J. Gillett* No. 1560 ! Hb. Brux.

219. C. orthoclada, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. (1871) 29; *Hiern, Cat. Welw. Afr. Pl.* i. 201.

Suffrutex erectus, virgatus, copiose ramosus. *Folia* trifoliolata, foliolis oblanceolatis apice mucronatis terminali longiore 10–35 mm. longis 3–8 mm. latis, petiolo communi 2–5 usque ad 10 mm. longo suffulta. *Flores* mediocres, lutei, in racemos plurifloros terminales et laterales dispositi. *Bracteæ* angustæ, pedicello longiores. *Calyx* extus cinereo-pubescens ; tubus campanulatus ; laciniæ lanceolatæ. *Vexillum* luteum, extus hirsutum. *Alæ* ovato-oblongæ. *Carina* dorso rotundata, 6–8 mm. longa. *Legumen* oblongum, hirsutum, sessile, 20–24 mm. longum, multispermum.

Cameroons ; Samulabo, *Ledermann* No. 5501 ! Hb. Berol.

Congo Region : Lulu Lumen, *Hendrichs* No. 3068 ! forma Hb. Brux.

Angola : Huilla, *Welwitsch* No. 1976 ! along the river Songwe, *Gossweiler* No. 1743 ! at the Cababa River near Kakonda, *Gossweiler* No. 4342 ! Hb. Mus. Brit. ; Huilla, *Antunes & Dekindt* No. 3026 ! Hb. Mus. Paris.

C. cytisoides, Hils. & Bojer, from Madagascar, is an ally.

220. C. caudata, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 18 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 198.

Suffrutex circ. 6 dm. altus, virgatus, erectus, ramosus. *Folia* trifoliolata, sessilia vel subsessilia, foliolis oblanceolatis vel oblongo-oblanceolatis apice mucronatis basi cuneatis 10–20 mm. longis 4–7·5 mm. latis pubescentibus. *Flores* lutei, parviusculi, in racemos breves paucifloros axillares dispositi. *Bracteæ* angustæ. *Calycis tubus* campanulatus; laciniæ lanceolatæ. *Vexillum* dorso pubescens, 8–9 mm. longum, luteum. *Alæ* oblongæ, unguiculatæ, 8 mm. longæ. *Carina* dorso rotundata, rostro brevi, in toto 7–9 mm. longa. *Legumina* oblonga, sessilia, 10–15 mm. longa, ferrugineo-hirsuta.

Angola: Pungo Andongo, *Welwitsch* Nos. 1933! 1944! Hb. Mus. Brit.

Suffruticose, with sessile leaves, few-flowered racemes, and oblong pods.

Series 43. Flores parviusculi, in racemos laxos plus minus elongatos dispositi. Carina dorso rotundata, 7–10 mm. longa. Stipulæ parvæ. Legumina oblonga, tomentosa vel hirsuta.

221. C. uguenensis, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 206 (1895).

Suffrutex ramosus, ubique petalis exceptis pilis ferrugineis villosus. *Stipulæ* inferiores lanceolato-subulatæ, superiores lineari-subulatæ. *Folia* trifoliolata, foliolis obovatis apice mucronatis basi cuneatis 15–35 mm. longis. *Racemi* longe pedunculati, folium 3–4-plo superantes, multiflori. *Bracteæ* setaceæ, pedicello breviores. *Calycis dentes* lanceolato-subulati, tubo fere 3-plo longiores. *Vexillum* calyce fere duplo longius, suborbiculare, apice leviter emarginatum. *Carina* cum ungue 8–10 mm. longa. *Ovarium* stipitatum. *Legumen* oblongum, calycem 2·5–3-plo superans.

German East Africa: Ugueno Hills, *Volkens* No. 523! Hb. Berol.

222. C. Schinzii, *Bak. fil.*, sp. nov.

Planta verisimiliter annua. *Caulis* tenuis, ramosus, plus minusve hirtus, 20–27 cm. longus. *Stipulæ* lanceolatæ, 3–5 mm. longæ. *Folia* trifoliolata, foliolis cinereo-tomentosis obovatis vel oblongo-obovatis apice mucronatis basi cuneatis 15–23 mm. longis 8–12 mm. latis, petiolo communi 7–11 mm. longo suffulta. *Flores* parviusculi, in racemos laxos dispositi, pedicellati. *Bracteæ* parvæ, ad basi pedicellorum positæ. *Calyx* totus circ. 5 mm. longus; tubus brevis; laciniæ lanceolatæ, tubo longiores. *Vexillum* flavum, lineis leviter striatum, obovatum. *Alæ* flavæ. *Carina* 7–9 mm. longa, falcata vel subfalcata, alis distincte longior. *Legumen* oblongum vel oblongo-oviforme, 10–12 mm. longum, cinereo-tomentosum, plurispermum, stipes calyce brevior. —Ad *C. uguenensem*, Taubert, accedens a qua facile carinæ rostro breviore distinguitur.

Transvaal: Sandrivier, alt. 2500 ft., *R. Schlechter* No. 4589! Hb. Turic.

Series 44. Flores mediocres, in racemos laxos dispositi. Carina dorso rotundata, circ. 9–10 mm. longa, lineis violaceis notata. Stipulæ parvæ. Legumen ignotum. Suffruticosa.

223. C. PHILLIPSIÆ, *Baker in Kew. Bull.* (1895) 213.

Suffruticosa an interdum fruticosa, ramulis gracilibus parce adpresse pilosis. *Folia* trifoliolata, foliolis subsessilibus obovatis basi cuneatis 16–20 mm. longis et latis facie viridibus dorso adpresse pilosis, petiolo communi 10–17 mm. longo prædita. *Flores* in racemos terminales et laterales sæpius 8–12-floros dispositi. *Racemi* longe pedunculati. *Bracteæ* subulatæ, minutæ. *Calyx* pubescens, dentibus lanceolatis vel deltoideis tubo æquilongis. *Petala* lutea, glabra, calyce duplo longiora. *Vexillum* obovatum, lineis atro-purpureis multis percursum. *Ovarium* cylindricum, multiovulatum.

SOMALILAND: Golis Range at Hammar, *Miss Edith Cole*! *Mrs. Lort Phillips*! Hb. Kew.; Sheikh Pass, *Major Thomson* No. 34! Hb. Kew.

Series 45. Flores parviusculi, in racemos subdensos dispositi. Carina circ. 10 mm. longa. Stipulæ lineari-lanceolatæ. Legumen adultum deest. Herba.

224. C. UKAMBENSIS, *Vatke in Œst. Bot. Zeit.* xxix. (1879) 219.

Herba pilis longis albidis vel ferrugineis obtecta. *Stipulæ* persistentes. *Folia* trifoliolata, foliolis lanceolatis vel oblongis superioribus linearibus supra glabris subtus imprimis secus nervos longe et adpresse pilosis, petiolo communi 15–35 mm. longo prædita. *Flores* in racemos 8–20- vel interdum 30-floros dispositi. *Bracteæ* setaceæ. *Calyx* albido-pilosus, basi bibracteolatus, dentibus triangularibus tubo duplo brevioribus. *Corolla* calyce duplo longior, circ. 10 mm. longa. *Carina* in sicco purpurea, dorso puberula, in rostrum modicum producta. *Legumen* juvenile pilis dense obtectum.

BRITISH EAST AFRICA: Kitui in Ukamba, *Hildebrandt* No. 2800! Hb. Kew.; Kibwesi, *Scheffler* No. 11! (forma) Hb. Mus. Brit., etc.

Series 46. Flores parviusculi, in racemos multifloros longe pedunculatos dispositi. Carina dorso rotundata, 5–6 mm. longa. Stipulæ inconspicuæ. Legumen ignotum. Annua erecta.

225. C. OLIGOSTACHYS, *Baker in Oliver, Fl. Trop. Afr.* ii. 41 (1871); *Hiern Cat. Welw. Afr. Pl.* i. 204.

Species habitu *C. lanceolatæ*, E. Mey. *Caulis* erectus, ramosus. *Folia* trifoliolata, foliolis oblongis vel ellipticis apice obtusis basi cuneatis breviter petiolulatis 25–50 mm. longis 9–15 mm. latis, petiolo communi 15–35 mm. longo suffulta. *Flores* parvi, in racemos multifloros dispositi. *Racemi* longe

pedunculati. *Bracteolæ* minutæ. *Calycis tubus* campanulatus, dentibus acutis, in toto circ. 4 mm. longus. *Vexillum* lineis purpureis notatum, 5–6 mm. longum. *Legumen* ignotum.

ANGOLA: Pungo Andongo, *Welwitsch* No. 1957! Hb. Mus. Brit.

The material of this species is not very satisfactory. It is evidently allied to *C. lanceolata*, E. Mey., but differs in the broader leaflets, etc.

Series 47. Flores in racemos 10–25-floros dispositi. Carina dorso rotundata, uncinata, 7–8 mm. longa. Stipulæ minutæ. Legumen lineari-oblongum, stipitatum.

226. C. UNCINATA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 33 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 202.

Herbacea, diffusa, 0·5–0·6 m. alta. *Rami* griseo-pubescentes, ramulis erecto-patentibus. *Stipulæ* setaceæ. *Folia* trifoliolata, foliolis subtus griseo-puberulis lanceolato-oblongis intermediis 24–36 mm. longis 10–16 mm. latis, petiolo communi 12–24 mm. longo suffulta. *Flores* in racemos laxos dispositi. *Bracteæ* setaceæ, persistentes. *Pedicelli* 4–6 mm. longi. *Calyx* circ. 3 mm. longus, dentibus lanceolato-acuminatis tubo longioribus. *Corolla* circ. 8 mm. longa. *Vexillum* lineis purpureis eleganter striatum. *Carina* uncinata. *Legumen* 24–30 mm. longum, 20–30-spermum, griseo-pubescens, glabrescens.

ANGOLA: Huilla, *Welwitsch* No. 1974! Hb. Mus. Brit.

Corolla yellow, standard brown-orange.

Series 48. Flores parvi vel parviusculi, in racemos sæpius multifloros et densos vel densiusculos rarius paucifloros dispositi. Carina dorso rotundata, 4–10 vel 11 mm. longa. Hujus seriei legumina omnia mihi cognita oblonga vel oblonga-cylindrica, sessilia vel breviter stipitata.

227. C. VALLICOLA, *Bak. fil.*, sp. nov.

Species ad *C. astragalinam*, Hochst. et *C. chrysochloram*, Bak. fil., accedens. *Caules* inter congeneres robustiusculi, cinereo-pubescentes, herbacei. *Stipulæ* subnullæ. *Folia* trifoliolata, foliolis elliptico-obovatis vel oblongo-obovatis basi cuneatis 26–30 mm. longis 10–15 mm. latis, petiolo communi 10–20 mm. longo suffulta. *Flores* parvi, in racemos densos dispositi. *Racemi* 5–10 cm. longi. *Bracteolæ* ad basin calycis lineares. *Calyx* circ. 4 mm. longus, pubescens, dentibus acutis. *Vexillum* circ. 5 mm. longum, in sicco striatum. *Carina* in sicco eleganter purpureo-striata, 4–5 mm. longa. *Legumina* oblonga, subsessilia, 14–16 mm. longa, depressa, pubescentia.

BRITISH EAST AFRICA: Eldoma Ravine, *A. Whyte*! Hb. Kew.

The stems of this species are cinereous-pubescent, and stouter than in *C. astragalina*, Hochst. The flowers are in a dense raceme, the carina rounded on the back, about 4–5 mm. long, the pod oblong.

228. C. PYCNOSTACHYA, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 584; *Baker in Oliver, Fl. Trop. Afr.* ii. 43.

C. melilotoides, Steud. ex A. Rich. Fl. Abyss. i. 155 (1847).

Erecta, diffusa. *Ramuli* angulato-striati, minute puberuli vel glabri. *Stipulæ* setaceæ. *Folia* trifoliolata, foliolis cuneato-oblongis obtusis emarginatis 20–28 mm. longis 6–10 mm. latis supra vel utrinque glabris, petiolo communi 8–15 mm. longo suffulta. *Flores* parvi, in racemos laterales densos breves 20–50-floros dispositi. *Racemi* iis *Meliloti officinalis* subsimiles. *Bracteæ* setaceæ, longæ. *Bracteolæ* minutæ. *Pedicelli* glabri, cernui. *Calyx* usque ad medium fissus, dentibus triangularibus acutis glabris. *Corolla* lutea, non striata. *Vexillum* luteum, carinæ subæquilongum. *Alæ* carina breviores. *Carina* rostro brevi, falcata, ±4 mm. longa. *Legumen* subsessile, oblongum, 8–12 mm. longum, 7–10-spermum, minute puberulum.

SUDAN: Sennaar, *Kotschy* No. 417! Hb. Kew.

ABYSSINIA: Near Gafta, *Schimper* (1842) No. 1213! Hb. Kew. etc.; near Gageros, *Schimper* No. 2191! Hb. Kew.; Abyssinia, *Schimper* (1853) No. 430! Hb. Kew.

BRITISH EAST AFRICA: Muka, *Kässner* No. 932! Hb. Mus. Brit.

Var. nov. DONALDSONII, *Bak. fil.*

Erecta, ramosa. *Folia* trifoliolata, foliolis glauco-viridibus. *Racemi* longiores, usque ad 15 vel 18 cm. longi, multiflori. *Calyx* totus circ. 4 mm. longus. *Flores* majores, flavi. *Carina* dorso rotundata, apice acuta, in toto circ 8–9 mm. longa. *Legumina* oblonga, 9–12 mm. longa, 7–10-sperma.

SOMALILAND: Schebelli, *Donaldson Smith*! Hb. Mus. Brit.

Var. nov. ANGOLENSIS, *Bak. fil.*

Annua, ramosa, a typo differt indumento copiosiore. *Caules* 12–15 mm. longi, tomentelli. *Folia* trifoliolata, foliolis glauco-viridibus elliptico-obovatis. *Flores* parvi, in racemos densos dispositi. *Bracteæ* lineares. *Bracteolæ* parvæ, lineares. *Calyx* tomentosus, ±4 mm. longus. *Carina* dorso rotundata, lutea, 5–6 mm. longa. *Legumen* tomentellum, sessile, oblongum, 9–11 mm. longum, circ. 10-spermum.

ANGOLA: Malange, in moist situations of sugar-cane plantations, *Gossweiler* No. 1334! Hb. Mus. Brit.

The stipules are either absent or early deciduous.

229. C. UTSCHUNGWENSIS, *Bak. fil.*, sp. nov.

Rami tenues. *Stipulæ* inconspicuæ. *Folia* trifoliolata, foliolis oblongis

10–17 mm. longis strigoso-pubescentibus, petiolo communi 6–8 mm. longo suffulta. *Flores* parviusculi, capitato-congesti, numerosi. *Bracteæ* parvæ. *Pedicelli* ferrugineo-pubescentes. *Calyx* totus 3·5 mm. longus, dentibus acutis. *Vexillum* ±5 mm. longum, flavum, striatum, ungue pubescente. *Alæ* oblongæ, carinæ subæquilongæ. *Carina* dorso rotundata, flava, 5·5 mm. longa. *Ovarium* lineari-oblongum. *Legumen* deest.

German East Africa: Uhehe, Utschungwe Berg, 1600 m., *Frau Hauptmann* Prince! Hb. Berol.

The flowers are small, in a globose head, with the leaves some distance from the flowers.

230. C. astragalina, *Hochst. in Schimp. Herb. Abyss.* No. 808; *Baker in Oliver, Fl. Trop. Afr.* ii. 43 (1871); *Schweinfurth in Bull. Herb. Boiss.* (1896) App. ii. 226.

C. striata, A. Br. in Flora, xxiv. (1841) 280, *non* DC.

C. abyssinica, D. Dietr. Syn. iv. 933 (1847).

Caules tenues ramosi. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis in typo cuneato-oblongis vel cuneato-ellipticis 15–25 mm. longis 6–8 mm. latis glauco-viridibus subtus et margine adpresse pilosis, petiolo communi 10–15 mm. longo suffulta. *Flores* parvi, in typo in racemos breves densifloros dispositi. *Bracteæ* parvæ, angustæ. *Bracteolæ* parvæ. *Calyx* totus 3–4 mm. longus; laciniæ lanceolatæ. *Vexillum* lineis violaceis notatum, 5–6 mm. longum. *Carina* 5–6 mm. longa. *Legumen* oblongum, 10–12 mm. longum, subsessile, 10–14-spermum.

Abyssinia: *Schimper* (1863–68) No. 560! Hb. Mus. Brit.; near Gapdia, *Schimper* (1842) No. 808! Hb. Mus. Brit.; near Arnam, *Schimper* (1844) No. 1495! Hb. Mus. Brit.

Eritrea, Bogos, *Hildebrandt* No. 571! Hb. Mus. Brit.; Mt. Alam Kale, *Schweinfurth & Riva* No. 1656! Hb. Turic.; *Dr. Terraciano* No. 325! Hb. Turic.; Maragus, *Pappi* No. 113! Hb. Mus. Brit.

Niamniamland: *Schweinfurth* No. 3909! Hb. Mus. Brit.

The following forms are described by Dr. Schweinfurth:—

Forma I. Racemus elongatus, longe pedunculatus.

Eritrea: Ambelaco, *Schweinfurth* No. 281 (1894).

Forma II. Racemus congestus, subcapitatus, longe pedunculatus, foliolis ovalibus vel obovatis.

Eritrea: Ginda, *Schweinfurth* No. 397 (1891); Ambelaco, *Schweinfurth* No. 279 (1894); south from Ginda, *Schweinfurth* No. 1899 (1892).

Forma III. Prostrata vel diffusa, parviflora, pedunculis abbreviatis, rariflora.

Eritrea: Ambelaco, *Schweinfurth* No. 278 (1894); Gaba, *Schweinfurth*

No. 1652 (1891); Geleb, *Schweinfurth* No. 1202 (1891); Ginda, *Schweinfurth* No. 506 (1891).

Dr. Schweinfurth distributed his No. 3909 from Niamniamland as *C. impressa*, Nees, which is a variety of *C. astragalina*, Hochst. with concolorous carina. *C. impressa*, Nees, was published in Del. Sem. Hort. Vrat. (1843) 3, but in Linnæa, 1842, p. 214, Nees states that it is the same as *C. striata*, A. Br.

Subsp. C. Onobrychis, *A. Rich. Tent. Fl. Abyss.* i. 154 (1847), pro sp.

Caulis erectus, ramosus. *Stipulæ* inconspicuæ. *Folia* trifoliolata, foliolis obovati-oblongis vel ellipticis 40–55 mm. longis 11–15 mm. latis, petiolo communi 25–30 mm. longo prædita. *Flores* parvi, in racemos elongatos dispositi. *Racemi* multiflori. *Calyx* totus 3–3·5 mm. longus. *Vexillum* venosum. *Carina* dorso rotundata, circ. 4–5 mm. longa. *Legumen* oblongum, glabrum, breviter stipitatum.

Abyssinia: Near Tchélatchékanné, *Quartin Dillon*! Hb. Mus. Paris; Gallabat, *Schweinfurth* No. 1877! Hb. Mus. Brit.

This plant has small purplish flowers, in an elongate and many-flowered raceme, the carina is falcate, and about 5 mm. long.

231. C. brachycephala, *Harms in Herb. Berol.*

Erecta. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis lineari-lanceolatis 25–33 mm. longis 6–8 mm. latis, intermediis majoribus, petiolo communi sæpius 6–18 mm. longo prædita. *Flores* parvi, in racemos subcapitatos breves densos dispositi. *Pedunculi* breves vel brevissimi. *Carina* dorso rotundata, 5–6 mm. longa. *Legumen* oblongum, plus minusve 11 mm. longum.

Galla Highlands; Arussi Galla, *Ellenbeck* No. 1557! Hb. Berol.

Allied to *C. astragalina*, Hochst.

232. C. chrysochlora, *Bak. fil. ex Harms in Deutschen Zentral Afr. Exped.* ii. 244 (1912).

Caules plures ex eadem radice orti, herbacei, 10–15 cm. longi. *Stipulæ* subnullæ. *Folia* trifoliolata, foliolis obovatis vel elliptico-obovatis 10–17 mm. longis 6–8 mm. latis subtus strigoso-pubescentibus, petiolo communi 5–10 mm. longo suffulta. *Flores* parviusculi, in racemos breves dispositi. *Bracteæ* parvæ, lineares. *Bracteolæ* circ. 1 mm. longæ, ad basin calycis positæ. *Calyx* totus circ. 4 mm. longus, dentibus acutis. *Vexillum* in sicco luteum, brunneo-striatum, 5–6 mm. longum. *Alæ* oblongæ, striatæ. *Carina* dorso rotundata, 5–5·5 mm. longa, striata. *Legumina* oblonga, circ. 12 mm. longa, sessilia, pubescentia.

Uganda: Mulema, *Bagshawe* Nos. 234! 253! Hb. Mus. Brit.

Ruanda: Nyarasongo and Nyansa, *Mildbraed* No. 692! Hb. Berol.

233. C. Plowdeni, *Baker in Oliver, Fl. Trop. Afr.* ii. 41 (1871).

Caulis herbaceus, striatus, sursum pube griseo indutus. *Stipulæ* 0. *Folia* trifoliolata, foliolis linearibus lineari-lanceolatis vel lineari-oblongis 25–50 mm. longis 4–5 mm. latis glabrescentibus, petiolo communi 12–16 mm. longo suffulta. *Flores* parviusculi, in racemos multifloros vel plurifloros dispositi. *Bracteæ* lineares, parvæ. *Vexillum* lineis purpureis notatum. *Alæ* oblongæ. *Carina* dorso suborbicularis, lineis purpureis percursa, apice acuta, circ. 8 mm. longa. *Ovarium* lineare, sessile, griseo-sericeum. *Legumen* adhuc ignotum.

Abyssinia: *Plowden*! Hb. Kew.

Allied to *C. mesopontica*, Taubert, but the leaves are longer and narrower.

234. C. Muansæ, *Bak. fil.*, sp. nov.

Caulis erectus, cinereo-subtomentosus. *Stipulæ* subnullæ. *Folia* trifoliolata, foliolis oblongis vel ellipticis 18–35 mm. longis 7–12 mm. latis, petiolo pubescente 15–28 mm. longo instructa. *Flores* parviusculi, in racemum densum terminalem dispositi. *Racemi* 25–40 mm. longi. *Calyx* 4·5–5·0 mm. longus, cinereo-subtomentosus, dentibus acutis tubo brevioribus. *Vexillum* in sicco purpureo-lineatum, ±7 mm. longum, unguiculatum. *Alæ* oblongæ, carina paullo longiores. *Carina* dorso rotundata, lineis purpureis notata, ±7 mm. longa. *Legumen* ±19 mm. longum, seminibus lævibus brunneis.

German East Africa: Muansa, *Dr. Stuhlmann* (Expedition Emin Pascha) No. 4659! Hb. Berol.; Umbugwe and Iraku, *Hauptmann Merker* No. 158! Hb. Berol.

This plant is cinereous-tomentose, and has an inflorescence of small flowers, in a dense head. It is allied to *C. Plowdeni*, Baker.

235. C. pycnocephala, *Bak. fil.*, sp. nov.

Suffrutex. *Caulis* erectus, pubescens. *Stipulæ* setaceæ, 2 mm. longæ. *Folia* trifoliolata, foliolis oblongo-obovatis vel ellipticis 10–18 mm. longis 7–9 mm. latis subtus pubescentibus, petiolo pubescente 2–5 mm. longo suffulta. *Flores* mediocres, flavi, in racemum terminalem dense congesti. *Racemi* 2·5–4·0 cm. longi. *Pedicelli* 2–3 mm. longi, pubescentes. *Bracteæ* angustæ. *Bracteolæ* 2, ad apicem pedicelli positæ. *Calyx* pubescens, in toto 4·5–5 mm. longus. *Vexillum* in sicco luteum, suborbiculari-obovatum. *Alæ* oblongæ, carinæ subæquilongæ. *Carina* dorso rotundata, 7–9 mm. longa, apice acuta. *Legumen* ignotum.

German East Africa: Msamvia, Lake Nyasa Expedition *Hauptmann* Fromm, *Muntzner* No. 53! Hb. Berol.

Allied to *C. mesopontica*, Taubert, and *C. emarginata*, Bojer.

The distinguishing features of this species are:—The yellow pubescence

of the stem, the oblong-ovate leaflets, the yellow flowers gathered in a dense head, the heads being not closely subtended by a number of leaves, but within 5 cm. of the uppermost leaf.

236. C. FWAMBOENSIS, *Bak. fil.*, sp. nov.

Species ad *C. astragalinam*, Hochst., accedens. *Caules* plures, adscendentes, pubescentes, graciles, 15–20 cm. longi. *Stipulæ* lineares. *Folia* trifoliolata, foliolis glauco-viridibus oblongo-ellipticis vel ellipticis apice mucronatis basi cuneatis 15–20 mm. longis 5–9 mm. latis, petiolo communi pubescente 3–6 mm. longo instructa. *Flores* parvi, in racemos densos subcapitatos pedunculatos dispositi. *Racemi* ±3 cm. longi. *Pedicelli* 1–2 mm. longi. *Bracteæ* lineares, 1·5 mm. longæ. *Calyx* extus pilis obtectus, 4·5 mm. longus, dentibus acutis. *Vexillum* lineatum, calyce longius, 7–8 mm. longum, unguiculatum. *Carina* dorso rotundata, 7–8 mm. longa, falcata vel subfalcata, apice acuta. *Legumen* ignotum.

NYASALAND: Fwambo, Lake Tanganyika, *Carson*! Hb. Kew.

A plant with ascending flexuous stems, trifoliolate glaucous leaves, oblong-elliptical leaflets and a head of small flowers, with a carina 7–8 mm. long and rounded on the back.

237. C. MESOPONTICA, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 207 (1895).

Suffrutex erectus, ramosus, pubescens. *Stipulæ* inconspicuæ. *Folia* trifoliolata, foliolis lineari-oblongis vel ellipticis 11–16 mm. longis 4–6 mm. latis subtus pallidioribus pubescentibus, petiolo 4–8 mm. longo suffulta. *Flores* parviusculi, in racemos dispositi, quam flores *C. emarginatæ*, Bojer, minores. *Bracteæ* 1–2 mm. longæ. *Calyx* hirtus in toto circ. 3 mm. longus; laciniæ acutæ. *Vexillum* suborbiculari-obovatum, striatum, calyce longius. *Alæ* oblongæ, carina breviores, circ. 7 mm. longæ. *Carina* 6–8 mm. longa, striata, calyce 2–3-plo longior.

Habitu *C. emarginatæ*, Bojer, floribus minoribus distinguenda.

GERMAN EAST AFRICA: Bukoba, *Stuhlmann* No. 4047! Hb. Berol.; West Karagwe, *Stuhlmann* No. 1970! Hb. Berol.; West Mpororo! *Stuhlmann* Nos. 3147! 3149! Hb. Berol.

238. C. CHIRINDÆ, *Bak. fil.*, sp. nov.

Caulis erectus, teres, ramosus, pubescens. *Stipulæ* lineari-lanceolatæ. *Folia* trifoliolata, foliolis oblongis vel ellipticis apice acutis basi cuneatis 15–90 mm. longis 5–30 mm. latis pubescentibus, costa superne impressa, petiolo communi 5–20 mm. longo instructa. *Flores* in racemos laterales et terminales multifloros dispositi. *Bracteæ* lineares, 4–5 mm. longæ. *Bracteolæ* lineares, calyce longiores. *Calyx* hirsutus, in toto 4–5 mm. longus dentibus acutis. *Vexillum* in sicco luteum, lineatum, carina distincte

brevius. *Alæ* carina breviores. *Carina* falcata, calyce longior, circ. 8 mm. longa. *Ovarium* hirsutum. *Legumen* 25–30 mm. longum, oblongum, hirsutum, polyspermum.

GAZALAND : Near Chirinda, alt. 1270 m., *C. F. M. Swynnerton* Nos. 397 ! 1498 ! Hb. Mus. Brit.

A small herb with yellow flowers, allied to *C. Kirkii*, Baker, and *C. pallida*, Dryand. The bracteoles are linear and adnate to the calyx near the base, 4–5 mm. long.

239. C. LATHYROIDES, *Guill. & Perr. Fl. Seneg. Tent.* i. 162 (1830–33); *Baker in Oliver, Fl. Trop. Afr.* ii. 35.

Annua e basi ramosa, ramis divaricatis patentibus. *Stipulæ* subnullæ. *Folia* trifoliolata, foliolis linearibus 30–40 mm. longis 15–25 mm. latis, subtus strigoso-pubescentibus superne glabris, petiolo communi 10–15 mm. longo suffulta. *Flores* in racemos breves dispositi, rubro-striati, parviusculi. *Bracteæ* parvæ. *Calyx* ad medium 5-fidus, dentibus lineari-lanceolatis. *Vexillum* ovale, flavum, lineis rubro-fuscis striatum. *Alæ* oblongæ. *Carina* rostriformis, alis longior, falcata, 6–8 mm. longa. *Legumen* pendulum, oblongum, 12–20 mm. longum, sessile, circ. 24-spermum, fere glabrum, seminibus ovato-compressis fusco-flavescentibus.

SENEGAMBIA: *Perrottet* ! Hb. Mus. Brit.

SIERRA LEONE: *Afzelius* ! Hb. Mus. Brit.

CAMEROONS: *Preuss* No. 625 ! Hb. Kew., etc.

240. C. CYLINDRICA, *A. Rich. Tent. Fl. Abyss.* i. 154 (1847).

C. tigrensis, Baker in Oliver, l. c. ii. 36.

Radix crassa. *Caulis* basi suffruticosus, erectus, cinero-pubescens vel fere glaber. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis oblongis vel oblanceolatis obtusis 15–35 mm. longis 4–6–9 mm. latis pulverulenti-pubescentibus, petiolo communi 3–6 mm. longo suffulta. *Flores* parviusculi, in racemos breves dispositi. *Bracteæ* minutæ. *Calyx* leviter sericeus, dentibus lanceolatis. *Flores* lutei. *Vexillum* supra unguem bicarunculatum. *Carina* lutea, striata, 8–10 mm. longa. *Legumina* sessilia, lineari-oblonga, 16–18 mm. longa, 6–8-sperma, glabra vel pubenti-cinerea.

ABYSSINIA : Near Adoua, *Petit* ! Hb. Mus. Paris ; Abyssinia, *Schimper* (1863–68) No. 259 ! Hb. Mus. Brit.

This is apparently not the *C. cylindrica* of Chiovenda in Ann. Ist. Bot. Roma, viii. 400.

241. C. SUBCAPITATA, *De Wild. in Ann. Mus. Congo,* sér. IV. i. 186 (1903).

Erecta. Rami pilis appressis sparse induti. *Stipulæ* setaceæ, 1–2 mm. longæ. *Folia* trifoliolata, foliolis superne glabris ovato-lanceolatis apice mucronulatis lateralibus 30–45 mm. longis 5–12 mm. latis, petiolo communi

10–20 mm. longo suffulta. *Flores* mediocres, in racemos terminales dispositi. *Inflorescentia* subcapitata. *Vexillum* longitudinaliter striatum, 8–9 mm. longum, ± 7 mm. latum. *Alæ* 7–8 mm. longæ, oblongæ. *Carina* dorso rotundata, lineis purpureis striata, circ. 10 mm. longa. *Legumen* deest.

CONGO REGION: Katanga, Lukafu, *Verdick* No. 611 ! Hb. Brux.

242. C. LUKAFUENSIS, *De Wild. in Ann. Mus. Congo*, sér. IV. i. 184 (1903).

Caules erecti, pilis albidis vestiti. *Stipulæ* obsoletæ. *Folia* trifoliolata, foliolis lanceolatis 10–16 mm. longis 1·5–3 mm. latis superne sparse pubescentibus subtus dense pubescentibus margine ciliatis, petiolo brevi suffulta. *Flores* mediocres, in capitula dispositi. *Calyx* 7–8 mm. longus, lobis acutis. *Vexillum* obovale, orbiculare, circ. 10 mm. longum, 7–8 mm. latum, extus pubescens. *Alæ* carina longiores. *Ovarium* pubescens. *Legumen* ignotum.

CONGO REGION: Lukafu, *C. Verdick* No. 469 ! Hb. Brux.

This plant is not a near ally of *C. Perrottetii*, as stated in the original description. It has trifoliolate leaves and lanceolate leaflets. The flowers are in globular or subglobular heads.

243. C. EMARGINATA, *Bojer* ; *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 584 ; *Baker in Oliver, Fl. Trop. Afr.* ii. 35.

Caulis erectus, striatus, pube denso griseo brevi obtectus. *Stipulæ* 0. *Folia* trifoliolata, foliolis oblongis lineari-oblongis vel oblongo-obovatis 12–40 mm. longis 5–13 mm. latis utrinque sericeis, petiolo communi 5–16 mm. longo prædita. *Flores* in racemos terminales multifloros dispositi. *Bracteæ* 1–2 mm. longæ. *Calyx* oblique campanulatus, dentibus acutis. *Vexillum* in sicco luteum, striatum, suborbiculari-obovatum. *Alæ* oblongæ, carina sæpius longiores, 9–11 mm. longæ, in sicco luteæ. *Carina* apice acuta, 10–11 mm. longa, in sicco rubro-purpurea. *Legumen* cylindricum, apice leviter sursum flexum, circ. 3 cm. longum, pubescens.

BRITISH EAST AFRICA: Nyika Country, *Rev. T. Wakefield*, Hb. Kew.; Ribe, *Rev. T. Wakefield*, Hb. Kew.; River Kena, *Kässner* No. 139 ! Hb. Mus. Brit.

PEMBA: *Bojer* ! Hb. Kew., *Voeltzkow* ! Hb. Berol.

GERMAN EAST AFRICA: Usambara, *Holst* Nos. 2132 ! 2619 ! Hb. Berol.; Tanga, *Volkens* No. 18 ! Hb. Berol.

244. C. TROPEÆ, *Mattei in Boll. Ort. Bot. Giard. Colon. Palermo*, vii. (1908) 174.

Annua, erecta vel prostrata, diffusa, caule anguloso sulcato piloso. *Stipulæ* minutæ, setaceæ. *Folia* trifoliolata, foliolis oblongo-linearibus obtusis integris supra intense viridibus glabrescentibus subtus pallidioribus adpresse

albo-pilosis, petiolo tenui elongato suffulta. *Racemi* laterales, oppositifolii, sessiles, densiflori, sæpe 20-flori et ultra. *Flores* parviusculi, breviter pedicellati. *Calycis lobi* lanceolati, acuti, pilosi. *Petala* flavescentia. *Vexillum* aurantiacum. *Legumina* fere sessilia, adpressa, subpendula, inflata, dorso compressa, parce pubentia, 12–14-sperma, seminibus brunneis rugulosis.

ITALIAN SOMALILAND: Torda Goscia, *Macaluso* No. 93.

Near *C. astragalina,* Hochst., but I have not seen this species.

Series 49. Flores parviusculi, numerosi, in racemos sæpissime terminales, rarius laterales dispositis. Carina falcata, subfalcata vel subrectangularis, 6–10 mm. longa. Stipulæ 0. Bracteæ lineares, conspicuæ. Legumina oblonga, deflexa. Herbæ erectæ, sæpius elatæ.

245. C. COMOSA, *Baker in Oliver, Fl. Trop. Afr.* ii. 34 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 203.

Erecta, usque ad 6–10 dm. alt., caulibus sulcatis brunneo-sericeis. *Folia* trifoliolata, foliolis oblanceolatis linearibus vel ellipticis apice mucronatis 50–65 mm. longis 5–30 mm. latis viridibus subtus sericeis, petiolo communi 50–65 mm. longo prædita. *Flores* in racemos densissimos multifloros dispositi. *Bracteæ* setaceæ, persistentes. *Pedicelli* sericei. *Calyx* totus circ. 5 mm. longus, dense sericeus. *Corolla* lutea. *Vexillum* purpureo-lineatum. *Alæ* oblongæ. *Carina* dorso rotundata, 6–7 mm. longa, apice acuta, rostro brevi. *Legumen* sessile, lineari-oblongum, 12–15 mm. longum, sericeum, 12–17-spermum.

CONGO REGION: Leusfu, *Vanderyst,* Hb. Brux.; Kitobola, *A. Flamigni* No. 139! Hb. Brux.

ANGOLA: Golungo Alto, *Welwitsch* No. 1959! and No. 1960! Hb. Mus. Brit.; No. 1961! Hb. Mus. Brit. (forma foliolis latioribus).

246. C. VATKEANA, *Engl. in Hochsgebirgsflora,* 245 (1895).

Caulis erectus, simplex vel pauci ramosus, superne strigoso-pilosus, 2–4 dm. longus. *Folia* trifoliolata, foliolis oblongo-ellipticis vel oblongis acutis 2–4 cm. longis 8–13 mm. latis strigoso-pilosis, petiolo communi circ. 1 cm. longo prædita. *Bracteæ* lineari-lanceolatæ, pedicellum superantes, 3 mm. longæ. *Flores* mediocres, in racemum terminalem multiflorum dispositi. *Calyx* oblique cupuliformis, sordide violescens, lacinia anteriore quam posticæ 2½-plo quam intermediæ 2-plo longiore. *Vexillum* obovatum, circ. 6 mm. longum. *Alæ* lineari-oblongæ, obtusæ. *Carina* subrectangularis, acuta, 7–8 mm. longa, rostro 3 mm. longo instructa. *Legumen* lineari-oblongum, circ. 17 mm. longum, dense molliter pilosum.

ABYSSINIA: Dschan Meda, *Schimper* (1863) No. 1221! Hbb. Berol., Mus. Brit.

247. C. DILLONIANA, *Baker in Oliver, Fl. Trop. Afr.* ii. 41 (1871).
Chrysocalyx Quartiniana, A Rich. Tent. Fl. Abyss. i. 159 (1847).
Chrysocalyx Petitiana, A. Rich. l. c.

Caulis erectus, subglaber, ramosus. *Rami* angulati. *Folia* trifoliolata, foliolis linearibus lanceolatis vel oblanceolatis apice mucronatis 4–9 cm. longis 6–10 mm. latis pallide viridibus, petiolo communi 20–30 mm. longo prædita. *Flores* parviusculi, in racemos elongatos multifloros dispositi. *Bracteæ* conspicuæ, lineares, 5–7 mm. longæ. *Bracteolæ* ad basin calycis positæ. *Pedicelli* 4–6 mm. longi. *Calyx* totus 4–4·5 mm. longus, dentibus acuminatis. *Vexillum* album vel luteum, purpureo-venosum. *Alæ* oblongæ. *Carina* 7–10 mm. longa, apice acuta, dorso rotundata. *Legumen* subsessile, oblongum, 11–22 mm. longum, tenuiter griseo-sericeum, 15–20-spermum.

ABYSSINIA: *Schimper* (1862) No. 461! Hbb. Mus. Brit., Turic.; *Quartin Dillon* No. 29! Hb. Mus. Paris; *Hildebrandt* No. 574! Hb. Mus. Brit.; *Petit*! Hb. Kew.; *Schimper* (1853) No. 107! Hb. Kew.; Gallabat, *Schweinfurth* No. 1875! Hb. Mus. Brit.; No. 1876! Hb. Schweinf.

NIAMNIAMLAND: *Schweinfurth* No. 3981! Hb. Schweinf. (forma foliolis longis angustis).

Forma CAMERUNENSIS, *Bak. fil.*

Caulis erectus, striatus, 1–1·5 m. alt. *Folia* foliolis quam iis typi paullo majoribus oblongo-lanceolatis vel oblongis usque ad 11·5 cm. longis, petiolo communi usque ad 9 cm. longo prædita. *Flores* aurei, lineis rubris notati, paullo majores, in racemos multifloros densos dispositi. *Calyx* circ. 5 mm. longus, pubescens.

CAMEROONS: Gamu, 480 m., *C. Ledermann* No. 5297! Hb. Berol.

Leaves bright green above, grey-green below.

Series 50. Flores mediocres, in capitula plus minusve dense congesta. Carina dorso rotundata, 7–11 mm. longa. Stipulæ parvæ. Legumina hujus seriei mihi cognita elliptico-oblonga, pilis ferrugineis sæpius vestita.

248. C. DENSICEPHALA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 21 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 199.

Caulis erectus, tomento brevi indutus. *Folia* trifoliolata, foliolis molliter ferrugineo vel fusco-tomentosis anguste obovatis foliolis lateralibus 30–35 mm. longis intermediis 50–55 mm. longis, petiolo communi 10–15 mm. longo prædita. *Flores* in capitula densissima multiflora congesta. *Calycis tubus* brevis; laciniæ lanceolatæ, hirtæ. *Alæ* oblongæ, unguiculatæ. *Carina* pubescens, apice incurva, 10–11 mm. longa. *Ovarium* oblongum, sericeum. *Legumen* ignotum.

ANGOLA: Pungo Andongo, *Welwitsch* No. 1919! Hb. Mus. Brit.

249. C. DUMETORUM, *Baker in Oliver, Fl. Trop. Afr.* ii. 22 (1871) ; *Hiern, Cat. Welw. Afr. Pl.* i. 199.

Caulis erectus, indumento brevi ferrugineo indutus, ramosus. *Stipulæ* minutæ. *Folia* trifoliolata, foliolis subtus molliter tomentosis oblongis vel obovato-oblongis lateralibus minoribus 20–45 mm. longis intermediis 40–80 mm. longis, petiolo communi 5–10 mm. longo suffulta. *Flores* mediocres, in capitula congesti, capitulis ad ramorum apices dispositis. *Bracteæ* angustæ. *Calyx* extus hirtus. *Vexillum* in sicco rubro-purpureum. *Alæ* oblonga, carina breviores. *Carina* apice incurva, acuta, ± 7 mm. longa. *Legumen* sessile, elliptico-oblongum, 6–8 mm. longum, pilis ferrugineis dense vestitum 3–4-spermum.

ANGOLA : Pungo Andongo, *Welwitsch* No. 1920 ! Huilla, *Welwitsch* No. 1921 ! Hb. Mus. Brit.

Closely allied to *C. densicephala*, Welw., but the stem is not so stout, the heads of flowers are not nearly so large, and the individual flowers are smaller.

250. C. LACHNOCLADA, *Harms in Baum, Kunene-Sambesi Exped.* 254 (1903).

Species ad *C. dumetorum*, Baker, valde accedens, a qua ægre discernitur. *Caulis* erectus, usque ad 40 cm. altus, dense hirto-villosus. *Folia* foliolis obovatis oblongo-obovatis vel oblongo-oblanceolatis apice rotundatis et mucronulatis basin versus cuneato-attenuatis 2·5–5 cm. longis 13–20 mm. latis intermediis subduplo majoribus, petiolo communi 7–12 mm. longo prædita. *Racemi* terminales, densi, pluriflori vel pauciflori, breves. *Pedicelli* brevissimi. *Calyx* ± 8 mm. longus. *Carina* dorso rotundata, 9–11 mm. longo. *Legumen* ignotum.

ANGOLA : Between Lassingua and Kuiriri, *Baum* No. 670 ! Hb. Berol. etc. ; Cutchi River, *Gossweiler* No. 3141 ! Hb. Mus. Brit.

Series 51. Flores mediocres, vel parviusculi, in racemos laxos vel laxissimos dispositi. Carina dorso angulo recto curvata, in toto 7–10 mm. longa. Stipulæ parvæ. Legumen oblongo-clavatum.

251. C. LAXA, *Franchet in Revoil Çomalis*, 24 (1882).

Frutex ramosus, ramis cortice pallide luteo tectis. *Folia* trifoliolata, foliolis obovatis basi cuneatis 5–8 mm. longis pubescentibus, petiolo communi pubescente 5–10 mm. longo suffulta. *Racemi* laxe pauciflori. *Bracteæ* ad basin pedicellorum, parvæ. *Pedicelli* graciles. *Calycis laciniæ* lanceolatæ, extus pubescentes. *Vexillum* luteum. *Alæ* carina breviores. *Legumen* basin versus attenuatum, 16–18 mm. longum, pubescens, stipite calycem æquante.

ABYSSINIA : *Salt* ! Hb. Mus. Brit.

SOMALILAND: *Revoil*! Hb. Mus. Paris; Gulf of Fadjourah, Obock, *Dr. Faurot*! Hb. Mus. Paris; Berbera, *G. W. Bury* No. 27! Hb. Mus. Brit.; Upper Sheik, *Mrs. Lort Phillips*! Wagga Mts., *Mrs. Lort Phillip*! Hb. Mus. Brit.; Between Dobar and Hammer, *Mrs. E. Lort Phillips*! Hb. Mus. Brit.; Darron, *James & Thrupp*! Hb. Kew.

A shrub with lax racemes of yellow flowers, and an oblong-clavate pod, 16–18 mm. long, the carina is curved at a right angle and has a straight rostrum.

252. C. DESERTICOLA, *Taubert in Herb. Schweinfurth.*

Erectus, ramosus. *Folia* trifoliolata, foliolis oblongis. *Flores* mediocres, in racemos laxos dispositi. *Bracteæ* persistentes, 1–2 mm. longæ. *Flores* circ. 1 cm. longæ. *Calycis tubus* oblique campanulatus, laciniæ lanceolatæ. *Vexillum* luteum, striatum, circ. 10 mm. longum, unguiculatum. *Alæ* oblongæ, 7–8 mm. longæ, carina breviores. *Carina* lutea, circ. 10 mm. longa. *Legumen* basin versus in stipitem brevem attenuatum, cum stipite 17–20 mm. longum.

NYASALAND: S.W. Nyasa, Kagehi, *Stuhlmann* No. 3483! Hb. Schweinfurth.

An erect, much branched plant, with lax inflorescence, and oblong-clavate pods, 17–20 mm. long. The carina at the back is bent at a right angle and the standard is more distinctly veined.

The leaf material is not satisfactory. It is certainly an ally of *C. laxa*, Franchet.

Series 52. Flores parviusculi, in racemos laxos elongatos dispositi. Carina dorso angulo recto curvata, inde in rostrum rectum attenuata, 5–10 mm. longa, lutea. Stipulæ nullæ vel minimæ. Legumen oviforme, stipitatum (*C. jerokoensis*, Bak. fil.).—Suffrutices ramosi, foliis trifoliolatis parviusculis.

253. C. PAULITSCHKEI, *Bak. fil.*, sp. nov.

C. parvula, G. Beck in Paulitschke, Harrar (1888) 454, fig. 7, *non* Welwitsch.

Caules suffruticosi, circ. 8 cm. alti, parce foliati. *Folia* petiolata, petiolis vix 4 mm. longis, trifoliolata, foliolis obovatis mucronulatis usque ad 6 mm. longis et 3 mm. latis supra glabris subtus parce appresse pilosis. *Racemi* pseudo-terminales, laxissimi, circ. 8-flori, 35 cm. longi. *Flores* cernui, 5–6 mm. longi. *Bracteæ* parvæ, oblongæ, pedunculos subæquantes. *Bracteolæ* binæ, æquales, calycis tubo adpressæ. *Calyx* scutelliformis. *Corolla* lutea. *Vexillum* late ovatum. *Carina* rostrato-acuminata, glabra. *Ovarium* subellipsoideum, stipitatum. *Legumen* deest.

HARRAR: *Hardegger & Paulitschke.*

254. C. JEROKOENSIS, *Bak. fil.*, sp. nov.

Fruticulus erectus, 0·5–1 m. alt., ramosus. *Rami* virgati, teretes, pubescentes. *Stipulæ* parvæ, lineares. *Folia* trifoliolata, foliolis cuneato-obovatis vel ovali-obovatis 10–15 mm. longis subtus strigoso-pubescentibus, petiolo communi 7–17 mm. longo suffulta. *Flores* aureo-lutei, mediocres, in racemos elongatos multifloros laxos dispositi. *Bracteæ* ad basin pedicelli, lineares, 1–2 mm. longæ. *Bracteolæ* parvæ, lineares, ad basin calycis adnatæ. *Calyx* totus 3 mm. longus, dentibus acutis. *Vexillum* 8–9 mm. longum, apice apiculatum. *Alæ* oblongæ. *Carina* 10 mm. longa. *Ovarium* distincte stipitatum. Species *C. senegalensi*, Bacle, affinis.

BRITISH EAST AFRICA: Boran, Jeroko, *Ellenbeck* No. 2197 ! Hb. Berol. In flower 13 May, 1901.

A shrublet with virgate branches, and lax, many-flowered racemes, the carina being rostrate, and about 10 mm. long. The leaves are rather small, and the petioles rather long. The pedicels are slender and reach 3·5 mm. in length.

Series 53. Flores parviusculi, 6–8 apice pedunculorum umbellatim dispositi. Stipulæ parvæ. Carina 4–5 mm. longa, dorso angulo fere recto curvata. Legumen cylindricum, appresse pilosum. Herba.

255. C. SERTULIFERA, *Taubert in Engl. Jahrb.* xxiii. (1896) 178.

Herba 8–10 cm. alta, erecta, a basi ramosa, ramulis adpresse pubescentibus. *Folia* trifoliolata, petiolata, foliolis lateralibus late oblique ovatis terminalibus orbiculari-obovatis basi cuneatis supra glabris circ. 9 mm. longis ± 8 mm. latis, lateralibus minoribus. *Pedunculi* 3–4 cm. longi. *Pedicelli* 2–3 mm. longi. *Calycis tubo* circ. 1 mm. longo, dentibus lanceolatis acutis ± 2 mm. longis. *Vexillum* circ. 4–5 mm. longum, calyce longius. *Carinæ* rostrum circ. 3 mm. longum. *Legumen* apice styli rudimento coronatum, subtus circ. 7 mm. longum, diametro 1·75 mm.

CONGO REGION: Mussumba des Muata Jamvo, *Pogge* No. 168 ! Hb. Berol.

A small plant with trifoliolate leaves, and the flowers arranged in a subumbellate manner at the ends of the peduncle.

Series 54. Flores mediocres, in racemos breves subumbellatos dispositi. Carina dorso angulo recto curvata, inde in rostrum rectum sensim attenuata, in toto circ. 9–10 mm. longa. Stipulæ minutæ. Legumina oblonga, sessilia, plurisperma.

256. C. ARGYROLOBIOIDES, *Baker in Kew Bull.* (1897) 249.

Perennis, erectus, valde ramosus. *Ramuli* adscendentes, teretes, pubescentes. *Folia* breviter petiolata, trifoliolata, foliolis oblanceolatis 6–12 mm. longis facie viridibus glabris dorso pallide pubescentibus. *Flores* in racemos

ad apices ramulorum dispositi. *Calyx* circ. 4 mm. longus, dense pubescens, dentibus lanceolatis vel deltoideis tubo æquilongis. *Carina* circ. 10 mm. longa. *Legumen* turgidum, pilosum, 6 mm. longum, seminibus 5–6 brunneis.

NYASALAND: Nyika Plateau, *Whyte* Nos. 109! 117! Hb. Kew.; Nyasaland, *Buchanan* No. 695! Hb. Kew.

Noticeable on account of the short racemes, the flowers being arranged in a subumbellate manner. The pods are sessile and oblong-globose, 5–6 mm. long.

Series 55. Flores parviusculi, in racemos laxos paucifloros dispositi. Carina ignota, an 8–10 mm. longa? Stipulæ obsoletæ. Legumen oblongum, glabrum, breviter stipitatum, cum stipite 15–18 mm. longum.

257. C. ASPALATHOIDES, *Lam. Dict.* ii. 202 (1786); *Harvey in Harvey & Sonder, Fl. Cap.* ii. 46.

Fruticulus. Rami virgati, subspinescentes. *Folia* trifoliolata, foliolis cuneato-oblongis apice rotundatis vel emarginatis 5–6 mm. longis glabris vel strigoso-pubescentibus, petiolo communi 2–3 mm. longo suffulta. *Pedicelli* ± 3 mm. longi. *Calyx* totus ± 4 mm. longus, dentibus 1·0–1·5 mm. longis acutis, 10-nervosus, strigoso-pubescens. *Vexillum* ignotum. *Carina* ignota. *Legumen* stipite 2–3 mm. longo suffultum.

CAPE: Bokkeveld, *Drege* No. 3334! Hbb. Turic., Mus. Paris.

The carina would probably be 8–10 mm. long. Shrub rigidly and much branched. Pod oblong, glabrous.

Series 56. Flores mediocres, flavi, in racemos dispositi. Carina dorso rotundata, 8–10 mm. longa. Stipulæ minutæ. Legumen oblongo-globosum. Frutex, foliis palmatim 4–5, rarius 3-foliolatis.

258. C. SAHARÆ, *Cosson in Bull. Soc. Bot. Fr.* xi. (1864) 165, t. 4.

Tota planta præter petala indumento molli induta, indurato-frutescens, divaricato-ramosa. *Folia* foliolis cum petiolo articulatis oblongis obtusis, petiolo communi mediocri. *Flores* in racemos plurifloros dispositi. *Bracteæ* angustæ, lineares. *Corolla* flava. *Calyx* dense sericeo-villosus, laciniis lanceolatis. *Vexillum* alas et carinam subæquans. *Carina* apice acutiuscula. *Legumen* molliter tomentosum, abortu subdispermum.

SAHARA: *H. Duveyrier*! Hbb. Mus. Paris, Kew.

Noticeable on account of the leaves being 3–4–5-foliolate.

Subsect. 4. OLIGANTHÆ.

Stipulæ parvæ vel angustæ vel obsoletæ. Flores solitarii vel pauci. Carina 5–20 mm. longa *.

Clavis specierum.

1.	Carina 10–20 mm. longa	2
	Carina 5–9 mm. longa	11
2.	Frutices vel suffrutices erecti.	3
	Suffrutex ramis diffusis	*Rhodesiæ.*
	Annuæ vel perennes, procumbentes	9
	Annuæ vel perennes, erecti vel suberecti	8
3.	Carina 13–20 mm. longa	4
	Carina 10–12 mm. longa	7
4.	Flores solitarii vel subsolitarii vel nonnunquam in racemos laxos dispositi	5
	Flores axillares, umbellato-fasciculati. Carina 13–16 mm. longa	*axillaris.*
5.	Carina 16–19 mm. longa. Folia 3–4-foliolata. Planta Africæ Orientalis Lusitanicæ	*Monteiroi.*
	Carina 14–17 mm. longa. Folia trifoliolata	6
6.	Foliola 15–25 mm. longa	*lukwangulensis.*
	Foliola 5–15 mm. longa	*ukingensis.*
7.	Foliola cuneato-obovata. Folia subsessilia	*sericifolia.*
	Foliola oblanceolata vel oblongo-oblanceolata. Carina ±10 mm. longa. Legumen oblongum, pilis fulvis obtectum	*gazensis.*
	Foliola oblonga. Legumen oviforme	*Kurtii* (p. 341).
	Foliola oblanceolata. Carina ±12 mm. longa. Legumen fusco-villosum	*rotundicarinata.*
	Foliola oblonga vel cuneato-obovata. Carina 10–12 mm. longa. Legumen pubescens, demum glabrescens	*saxatilis.*
8.	Herba erecta, pilis obtecta. Legumen pilis obtectum	*Zimmermannii.*
	Herba suberecta, pilis obtecta. Legumen glabrum	*podocarpa* (p. 416).
9.	Legumen oblongum, glabrum, subglaucescens. Flores 2–3	*Quartiniana.*
	Legumen oviforme, rugosum, sessile. Flores solitarii vel pauci. Foliola oblonga vel elliptica	*trachycarpa.*
	Legumina hirta vel pilosa	10
10 (*a*)	Flores sæpius solitarii. Foliola ovata vel ovato-elliptica. Planta bongensis	*Taubertii.*
(*b*)	Flores solitarii vel gemini. Foliola oblonga vel ovato-lanceolata, 7–10 mm. lata. Planta intertropicalis	*Barkæ.*
(*c*)	Flores sæpius gemini. Foliola ovata vel ovato-lanceolata, 10–18 mm. lata. Planta hereroensis	*geminiflora.*
11.	Frutices vel suffrutices, foliis sessilibus vel subsessilibus	12
	Fruticuli vel suffrutices, foliis petiolatis	15
	Herbæ annuæ vel perennes	18
12.	Calyx 4–5 mm. longus	13
	Calyx 6–7 mm. longus	14

* See note on p. 314, which applies here also.

13.	Foliola lineari-lanceolata, 1–2 mm. lata	*leptoclada.*
	Foliola oblanceolata, 3–4 mm. lata	*Harmsiana.*
14.	Foliola ovato-oblonga	*sylvicola.*
	Foliola anguste oblanceolata	*subsessilis.*
15.	Suffrutices prostrati vel decumbentes vel ramis diffusis	16
	Suffrutices vel fruticuli, erecti	17
16.	Prostrata vel decumbens, ramulis patentim pilosis	*lotoides.*
	Rami diffusi, cinereo-tomentosi	*variegata.*
17.	Foliola oblongo-obovata. Legumen obovoideo-oblongum, circ. 10 mm. longum	*pauciflora.*
	Foliola oblanceolata. Legumen oviforme, 10–12 mm. longum	*Forbesii* (p. 340).
	Foliola cuneato-obovata. Legumen 25–28 mm. longum	*Thomsoni.*
	Foliola elliptica vel obovata. Legumen 15–17 mm. longum	*distantiflora* [(p. 367).
18.	Plantæ annuæ vel perennes, humiles	19
	Plantæ annuæ vel perennes, elatiores	23
19.	Plantæ Austro-Africanæ	20
	Plantæ intertropicales	21
20.	Foliola lineari-subulata. Pedunculi 1–2-flori	*angustissima.*
	Foliola obovata vel oblonga. Pedunculi 1–2-flori	*excisa.*
	Foliola obovata vel oblonga. Pedunculi 3–6-flori	*effusa.*
	Foliola anguste-obovata, sericeo-canescens. Legumen glabrum. Pedunculi 1-flori, oppositifolii	*sparsiflora.*
21.	Legumen glabrum, 15–16 mm. longum	*polyclados.*
	Legumen cum stipite circ. 3 cm. longum	*cyanea* (p. 355).
	Legumina non glabra	22
22.	Herbacea, decumbens, filiformis. Carina 6–8 mm. longa	*microphylla.*
	Herba dichotome ramosa, habitu *Dorycnii.* Carina 5–6 mm. longa	*microcarpa.*
23.	Legumina oblonga, stipitata. Carina dorso rotundata	24
	Legumina oviformia. Carina dorso angulo recto curvata	*Grantiana* (p. 341).
	Legumina oviformia vel clavato-oblonga, stipitata. Carina dorso rotundata	25
24.	Subglaber. Legumen cum stipite 20–22 mm. longum, 20–25-spermum	*glaucoides.*
	Pubescens. Legumen cum stipite 16–20 mm. longum, 8–12-spermum	*Loandæ.*
25.	Foliola oblongo-lanceolata, 4–8 mm. lata. Species austro-occidentalis et centralis	*Barnabassii* [(p. 356).
	Foliola elliptica vel ovata, 7–17 mm. lata. Species natalensis	*natalensis* (p. 357).
	Foliola elliptica vel ovata, 18–30 mm. lata. Species intertropicalis	*Doniana* (p. 356).

Series 57. Flores majusculi, sæpius solitarii, rarius in racemos laxos dispositi. Carina naviculariformis, 16–19 mm. longa. Stipulæ inconspicuæ. Legumina oblongo-clavata. Frutex erectus.

259. C. Monteiroi, *Taubert MS. in Herb. Berol.*

Frutex ramosus, non spinosus, circ. 1–1·3 m. alt. *Folia* 3–4-foliolata, foliolis ellipticis obovatis vel cuneato-obovatis 5–10 mm. longis 3–6 mm. latis, petiolo communi pubescente 5–10 mm. longo suffulta. *Flores* majusculi,

sæpius solitarii. *Pedicelli* 3–5–10 mm. longi. *Bracteolæ* parvæ, apicem versus pedicelli positæ, 1·5 mm. longæ. *Calyx* totus 7–8 mm. longus, dentibus triangularibus acutis. *Vexillum* suborbiculari-ellipticum, cum ungue circ. 17 mm. longum, circ. 12 mm. latum. *Alæ* oblongæ, unguiculatæ, 14–15 mm. longæ. *Carina* dorso rotundata, apice acuta. *Ovarium* dense pubescens, anguste oblongum, stipitatum.

PORTUGUESE EAST AFRICA: Delagoa Bay, *Mrs. Monteiro*! *Junod*! Hb. Berol.; *L. Scott*! *Speke* No. 5! Hb. Kew.; Lourenço Marques, *Schlechter* No. 11541! Hb. Turic.

A shrub with 3–4-foliolate leaves and generally solitary, rather large flowers.

Series 58. Flores mediocres, axillares, pauci. Carina 13–16 mm. longa. Stipulæ minutæ, deciduæ. Legumina oblongo-clavata, basi in stipitem attenuata. Suffrutex.

260. C. AXILLARIS [*Dryand. in*] *Aiton, Hort. Kew.* iii. 20 (1789); *Brown in Tuckey's Congo*, Append. 478; *Hiern, Cat. Welw. Afr. Pl.* i. 204.

C. Hildebrandtii, Vatke in Œst. Bot. Zeit. xxix. (1879) 220.

C. lotifolia, Baker in Oliver, Fl. Trop. Afr. ii. 42.

Suffrutex erectus, puberulus. *Folia* trifoliolata, foliolis oblongis vel ellipticis vel ovatis 30–60 mm. longis 15–28 mm. latis subtus puberulis pallidioribus, petiolo communi 3–8 cm. longo prædita. *Flores* umbellato-fasciculati. *Bracteæ* minutæ. *Calycis dentibus* deltoideis elongatis. *Vexillum* calyce longius. *Alæ* oblongæ. *Carina* dorso curvata, apice in rostrum sensim attenuata. *Legumen* sæpe 45–55 mm. longum.

GUINEA: *Brass*, Hb. Mus. Brit.

NIGERIA: Niger, *Vogel* No. 91! Hb. Kew.

CONGO REGION: *Chr. Smith*! Hb. Mus. Brit.

BRITISH EAST AFRICA: Galunka, *Kässner* No. 827! Hb. Mus. Brit.; Tschamtei in Duruma, *Hildebrandt* No. 2329! Hb. Mus. Brit.

ANGOLA: Ambriz, *Welwitsch* No. 1978! Hb. Mus. Brit.; Angola, *Mrs. Monteiro*! Hb. Kew.

GERMAN EAST AFRICA: Kilimanjaro, *Volkens* Nos. 118! 514! Hb. Berol.; Usambara, *Buchwald* No. 622! Hb. Berol.

ZANZIBAR: *Boivin*! Hb. Mus. Paris.

PEMBA: *Kässner* No. 385! Hbb. Mus. Brit., Berol.

NYASALAND: *Buchanan* (1891) No. 731! and No. 83! Hb. Kew.; Shire Highlands, *Adamson* No. 266! Hb. Kew.; Plains of Zomba, *Whyte*! Hb. Kew.; Zomba, *Manning* No. 12! Hb. Kew.

Series 59. Flores mediocres, in racemos laxos dispositi vel solitarii vel subsolitarii. Stipulæ parvæ. Carina 15–17 mm. longa. Legumen in *C. lukwangulense* magnum, glabrum, stipitatum. Frutices.

261. C. LUKWANGULENSIS, *Harms in Engl. Jahrb.* xxviii. (1900) 400.

Frutex 1–2-metralis, ramulis brevissime subsericeo-puberulis demum glabrescentibus. *Folia* trifoliolata, foliolis obovatis oblongis vel ellipticis, intermediis 15–25 mm. longis, petiolo communi 10–20 mm. longo suffulta. *Flores* majusculi. *Carina* dorso genuflexa. *Ovarium* oblongum, stipitatum, pluriovulatum. *Legumen* stipite circ. 10 mm. longo instructum.

GERMAN EAST AFRICA: Central Uluguru, Lukwangulu Plateau, *Goetze* No. 281! Hb. Berol.

A shrub 1–2 metres high with orange-coloured flowers, allied to *C. saxatilis*, Vatke, but the flowers are larger.

It seems to me advisable to retain the Sect. Oliganthæ only as a Subsection, as, for instance, in the present species, the flowers are either solitary, subsolitary, or in racemes.

262. C. UKINGENSIS, *Harms in Engl. Jahrb.* xxx. (1901) 323.

Frutex ramosus, virgatus, usque ad 2 m. altus, molliter pubescens, dense foliosus. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis elliptico- vel oblongo-obovatis 5–15 mm. longis supra glabris subtus subsericeo-puberulis, petiolo communi 7–15 mm. longo instructa. *Flores* mediocres, solitarii, gemini, vel pauci et racemosi. *Pedicelli* tenues, 12–20 mm. longi. *Bracteolæ* parvæ, supra medium pedicelli insertæ, lineares. *Calyx* totus 7–9 mm. longus, extus subsericeo-pubescens vel puberulus. *Vexillum* extus sericeo-pubescens vel puberulum. *Alæ* oblongæ, circ. 14–15 mm. longæ. *Carina* apice in rostrum attenuata, 14–15 mm. longa. *Ovarium* stipitatum. *Legumen* deest.

GERMAN EAST AFRICA: Ukinga, Mt. Yariri, *Goetze* No. 1195! Hb. Berol.

A virgate shrub with rather small leaves allied to *C. saxatilis*, Vatke.

Series 60. Flores mediocres, 1–2–3 in extremitate pedunculorum dispositi. Carina 8–15 mm. longa. Bracteolæ ad basin singulorum florum binæ. Stipulæ angustæ. Legumina oblonga vel oviformia, sessilia vel stipitata. Plantæ annuæ, vel perennes, sæpissime hirtæ.

263. C. QUARTINIANA, *A. Rich. Tent. Fl. Abyss.* i. 158 (1847); *Baker in Oliver, Fl. Trop. Afr.* ii. 42.

Caules e basi ramosi, ferrugineo-tomentosi. *Stipulæ* setaceæ, pilosæ. *Folia* trifoliolata, foliolis ovalibus intermedio lateralibus latiore 20–35 mm. longis 13–23 mm. latis subtus piloso-sericeis, petiolo communi 25–35 mm.

longo prædita. *Flores* in extremitate pedunculorum sæpius 2–3. *Bracteolæ* binæ. *Calyx* 5-partitus, laciniis foliaceis inæqualibus, 2 superioribus multo majoribus. *Corolla* calyce paullo longior. *Legumen* breviter stipitatum, oblongum, glabrum, subglaucescens.

ABYSSINIA: Prov. Chire, *Quartin Dillon*, Hb. Mus. Paris; Ankober, *Dr. Rohr*! Hb. Kew.; between Harrar and Addis Abbeba, *Welby*! Hb. Kew.

264. C. TAUBERTII, *Bak. fil.*, sp. nov.

Annua. *Caules* ramosi, flexuosi, hirti. *Stipulæ* filiformes. *Folia* trifoliolata, foliolis ovatis vel ovato-ellipticis 20–30 mm. longis 12–17 mm. latis, petiolo hirto 18–40 mm. longo suffulta. *Flores* axillares, solitarii, iis *C. podocarpæ*, DC., subsimiles. *Bracteolæ* 2, sub calyce positæ, circ. 3–5 mm. longæ. *Calyx* totus circ. 14–15 mm. longus; laciniæ tubo longiores. *Legumen* oviforme, ± 20 mm. longum, hirtum, stipite circ. 2 mm. longo suffultum.

BONGOLAND: Addai, *Schweinfurth* No. 2521! Hb. Schweinf.

Allied to *C. Quartiniana*, A. Rich. This is the *Crotalaria Schweinfurthii* of Taubert, but not of Deflers (Bull. Soc. Bot. Fr. xxxii. (1885) 348). This latter species comes from Aden.

265. C. TRACHYCARPA, *Taubert MS. in Herb. Berol.*

Radix lignosa. *Caules* plures, ex eadem radice orti, sursum hirti. *Stipulæ* lineares. *Folia* trifoliolata, foliolis oblongis vel ellipticis 10–15 mm. longis 3–6 mm. latis, petiolo communi 5–10 mm. longo suffulta. *Bracteolæ* 2, lanceolatæ, conspicuæ, sub calyce positæ, circ. 5 mm. longæ, hirtæ. *Calycis* laciniæ tubo multoties longiores, lanceolatæ. *Vexillum* obovatum. *Carina* dorso angulata, apice longe attenuata, unguiculata, in toto 11–14 mm. longa. *Legumen* oviforme, sessile, 10–12 mm. longum, rugosum.

EAST AFRICA: *Fischer* No. 212! Hb. Berol.

The distinguishing features of this plant are the woody rootstock, the narrow stipules, the flowers generally 1–3 on long peduncles, the conspicuous bracteoles, the oviform, sessile, rough pod.

It is allied to *C. Quartiniana*, A. Rich.

266. C. BARKÆ, *Schweinfurth in Bull. Herb. Boiss.* iv. (1896) App. II. 226.

Annua spithamæa, diffuse ramosa, caulibus cum petiolis pedunculis patenter et molliter pilosis. *Stipulæ* lineari-subulatæ, petiolo 6–10-plo breviores. *Foliola* subuninervia, æqualia, subtus præcipue ad nervum medium pilosa, ovato-lanceolata vel oblonga, 10–30 mm. longa 7–10 mm. lata, petiolo communi 15–30 mm. longo. *Pedunculi* uniflori, rarius biflori, folio oppositi. *Bracteolæ* lanceolatæ. *Calyx* circ. 10 mm. longus, laciniis tubum circ. 5-plo superantibus. *Vexillum* calycem vix excedens. *Carina* alas æquans, angulo

recto curvata. *Legumen* coriaceo-induratum, breviter stipitatum, globoso-obovoideum, ± 15 mm. longum.

ABYSSINIA : *Schimper* (1853) No. 814 ! Hb. Kew. ; Berreshowa, *Schimper* (1853–58) No. 442 ! Hbb. Kew., Mus. Brit.

NIGERIA : Katagum District, *Dalziel* No. 13 ! Hb. Kew.

ERITREA : *Schweinfurth* No. 277 ! Hb. Schweinf.

This plant is an annual, with solitary flowers, and a globose, obovoid, shortly stipitate pod, scarcely twice the length of the calyx, softly clothed with spreading hairs.

267. C. GEMINIFLORA, *Dinter in Hbb. Berol. et Turic.*

Procumbens, diffuse ramosus. *Rami* flexuosi, herbacei, hirti. *Stipulæ* lineares, 5–7 mm. longæ, hirtæ. *Folia* trifoliolata, foliolis ovatis ovato-lanceolatis vel ellipticis 10–33 mm. longis 10–18 mm. latis, petiolo communi 15–37 mm. longo suffulta. *Flores* axillares, gemini vel solitarii. *Pedunculi* fructiferi usque ad 4 cm. longi, floriferi hirti, breviores. *Bracteolæ* infra calycem conspicuæ, lanceolatæ, hirtæ. *Calycis* laciniæ lanceolatæ, 8–9 mm. longæ, tubo longiores. *Vexillum* calyce paullo longius, luteum. *Carina* in sicco 11–12 mm. longa, apice in rostrum attenuata, calyce paullo longior. *Legumen* oviforme, hirtum, subsessile, 12–18 mm. longum, stipite circ. 3 mm. longo suffultum.

HEREROLAND : Okahandja, *Dinter* No. 473 ! Hbb. Berol., Turic. In flower and young fruit, March, 1906.

This plant is a much branched, hairy, herbaceous annual, allied to *C. Taubertii*, Bak. fil. The leaflets are ovate to ovate-lanceolate, the flowers borne on long peduncles, either geminate or solitary, the calyx-lobes much longer than the tube, whilst the pod is egg-shaped and hairy.

Series 61. Flores mediocres, in racemos paucifloros dispositi. Stipulæ parvæ. Carina dorso angulata, 10–13 mm. longa. Calycis lobi foliacei. Bracteolæ sub calyce conspicuæ. Legumen breviter stipitatum, pilis obtectum. Herba.

268. C. ZIMMERMANNII, *Bak. fil. in Notizblatt Konigl. Bot. Garten*, No. 52, 66 (1913).

Herba caule erecto tereti ramoso pilis obtecto. *Stipulæ* parvæ, lineares. *Folia* trifoliolata, foliolis cuneato-ellipticis vel cuneato-oblongis basi in petiolulum attenuatis apice rotundatis vel leviter emarginatis 10–20 mm. longis 6–11 mm. latis, utrinque strigoso-hirtis, petiolo communi 10–20 mm. longo instructa. *Flores* mediocres, in racemos laterales circ. 2–4-floros dispositi. *Calycis tubus* campanulatus ; lobi foliacei, fructiferi, 8–10 mm. longi. *Bracteolæ* lanceolatæ, 4–5 mm. longæ, sub calyce positæ. *Alæ* oblongæ, unguiculatæ. *Carina* lutea, dorso angulo fere recto curvata, inde in rostrum

attenuata, in toto 10–13 mm. longa. *Legumen* oblongo-oviforme, 2–3 cm. longum, pilis obtectum.

GERMAN EAST AFRICA: Situmansi Mohorro, *Dr. Braun* No. 3602 ! Hb. Bot. Institut. Amani, No. 3449 ! Hb. Berol.

A plant with lax 2–4-flowered racemes, long foliaceous calyx-lobes, and shortly stipitate, oblong-oviform, hairy pods. An ally of *C. Winkleri*, Bak. fil., and also of *C. Quartiniana*, A. Rich.

Series 62. Flores lutei, axillares, pauci. Carina dorso rotundata, sæpius 8–12 mm. longa. Stipulæ parvæ. Legumina hirtella vel glabrescentia, oblonga, sessilia vel basi attenuata.

269. C. THOMSONI, *Oliver in Journ. Linn. Soc., Bot.* xxi. (1885) 399; *Oliver in Hook. Icones*, t. 1494.

C. Holstii, Taubert in Engler, Die Gliederung der Vegetation von Usambara, 63.

Fruticulus ramosus, 80–120 cm. altus, caulibus gracilibus ultimis hirtis. *Stipulæ* lineares, deciduæ. *Folia* trifoliolata, foliolis ellipticis vel obovatis obtusis mucronatis 10–20–32 mm. longis 6–14 mm. latis reticulatis pilis setisve paucis adpressis pagina superiore vel utrinque onustis, petiolo communi 5–15 mm. longo prædita. *Flores* mediocres, pedunculati, solitarii vel gemini, pedunculis folio oppositis vel quasi terminalibus medio articulatis bracteatis apice bibracteolatis. *Bracteolæ* lineari-subulatæ, tubo calycis subæquilongæ. *Calyx* parce hirtellus, profunde 5-fidus, lobis lanceolatis acutis. *Vexillum* purpureo-striatum, dorso medio hirsutum, calyce fere duplo longius. *Alæ* falcatæ, oblongæ. *Carina* dorso semiorbicularis, apice breviter rostrata, marginibus plus minusve hirsutis, ± 8 mm. longa. *Legumen* adpresse hirtellum, turgidum, utrinque attenuatum, oblongum, 18–25 mm. longum.

BRITISH EAST AFRICA: Kapte Plateau, Masai Country, *J. Thomson* ! Hb. Kew.

GERMAN EAST AFRICA: Usambara, *Holst* No. 9066 *a* ! Hbb. Berol., Turic.; Kilomelala, *Busse* No. 2970 ! Muera, *Busse* No. 2860 ! Between Muera and the Noto Plateau, *Busse* No. 2900 ! Hb. Berol.

270. C. SAXATILIS, *Vatke in Œst. Bot. Zeit.* xxix. (1879) 219.

C. goodiæformis, Vatke, l. c. 220.

Frutex 2–4 m. altus, partibus novellis exceptis glabriusculus. *Stipulæ* minutæ, deciduæ. *Folia* foliolis 3 cuneato-obovalibus vel ovatis emarginatis 10–35 mm. longis 10–20 mm. latis, petiolo communi 8–40 mm. longo suffulta. *Flores* pedunculati, sæpius bini, rarius in racemos dispositi. *Bracteolæ* ad basin calycis adnatæ. *Calycis* lobi tubo longiores. *Carina* flava, dorso rotundata vel semiorbicularis, rostro brevi instructa, circ. 10–12 mm. longa. *Legumen* pubescens, demum glabrescens, utrinque attenuatum, circ. 30–40 mm. longum.

British East Africa: Kitui in Ukamba, *Hildebrandt* No. 2804! Hb. Mus. Brit.; Maungu, *Scott Elliot* No. 6146! Nairobi, *Kässner* No. 983! Gaditu, *Kässner* No. 879! Galunka, *Kässner* No. 837! Hb. Mus. Brit.; Kibwesi, *Scheffler* No. 10! Hb. Kew.; Ndi, Taita, *Hildebrandt* No. 2548! Hb. Berol.

German East Africa: Uguenogebirge, *Volkens* No. 516! Hb. Kew.; Kilimanjaro, *Schellings* No. 65! Hb. Berol.; Usambara, *Holst* Nos. 8974! 9066 *a*! Hb. Berol.; Amani, *Braun* No. 1376! Hb. Berol.; Wadiboma, *Fischer* No. 169! Hb. Berol.; Ruahes River, *Goetze* No. 448! Hb. Berol.; Uhehe, *Goetze* No. 553! (forma) Hb. Berol.

Series 63. Flores mediocres vel parvi, in racemos paucifloros et laxos dispositi. Carina dorso rotundata, 5–7 mm. longa. Legumina pubescentia vel glabra, oblonga vel oblongo-cylindrica, stipitata. Plantæ perennes vel suffrutices.

271. C. glaucoides, *Bak. fil.*, sp. nov.

Species ad *C. glaucam*, Willd., accedens a qua primo intuitu differt foliis trifoliolatis.

Suffrutex videtur erectus, ramosus, teres, subglaber, longitudinaliter striatus. *Stipulæ* subnullæ. *Folia* trifoliolata, foliolis linearibus vel lineari-lanceolatis apice acutis basi in petiolulum attenuatis, 30–45 mm. longis 3–4 mm. latis strigoso-pubescentibus, costa subtus prominente, petiolo communi 15–22 mm. longo suffulta. *Racemi* laxi, 2–4-flori; pedicelli calyce longiores. *Bracteæ* ad basin pedicellorum parvæ. *Calycis lobi* tubo longiores. *Carina* dorso rotundata, apice acuta, calyce longior breviter stipitata, in toto circ. 6 mm. longa. *Legumen* pubescens, oblongum, cum stipite circ. 20–22 mm. longum, stipite 1·5–2·0 mm. longo.

Senegambia: Cape Manuel, *Dr. Talmy* No. 12! Hb. Brux.

Allied to *C. glauca*, Willd., which is a member of the Simplicifoliæ. The present species is easily recognised by the terete, branching stem, the trifoliolate leaves with narrow leaflets, the very lax 2–4-flowered raceme, the carina rounded on the back, and the oblong stipitate, 20–25-seeded pods.

272. C. Loandæ, *Bak. fil.*, sp. nov.

Perennis, erecta, valde ramosa, ramis teretibus. *Stipulæ* parvæ, lineares. *Folia* trifoliolata, foliolis oblongis vel oblongo-oblanceolatis 5–25 mm. longis 5–7 mm. latis, pubescentibus, costa superne impressa, petiolo communi 7–10 mm. longo instructa. *Flores* parvi, in racemos laterales paucifloros dispositi. *Bracteæ* parvæ, angustæ. *Bracteolæ* angustæ. *Pedicelli* tenues. *Calycis tubus* oblique campanulatus, dentibus lanceolatis tubo longioribus. *Carina* uncinata, circ. 5 mm. longa, rostro brevi suffulta. *Legumen* oblongum, cum stipite in toto 16–20 mm. longum, pubescens, 8–12-spermum.

ANGOLA : Loanda, *Gossweiler* No. 381 ! Hb. Mus. Brit.

The distinguishing features of this plant are the small flowers, in few-flowered lateral racemes, and the stipitate oblong pod.

Series 64. Flores mediocres, pauci, apicem versus pedunculorum dispositi. Carina dorso rotundata, sæpius 9–14 mm. longa. Stipulæ parvæ. Legumina mihi cognita subsessilia, oblonga. Herbæ vel suffrutices, diffusæ vel prostratæ, humiles.

273. C. EXCISA, *Bak. fil.*, comb. nov.

C. humilis, Ecklon & Zeyher, Enum. 174 (1836) ; Benth. in Hook. Lond. Journ. Bot. ii. (1843) 574 ; Harvey in Harvey & Sonder, Fl. Cap. ii. 41 ; Bolus & Wolley Dod, Fl. Plants and Ferns of Cape Peninsula, 255.

C. diffusa, E. Mey. in Linnæa, vii. (1832) 151, *non* Link.

C. effusa, E. Mey. Com. 25 (1825) ex parte.

Lotononis diffusa, Eckl. & Zeyh. Enum. 177 (1836).

Lotononis perplexa, Eckl. & Zeyh. l. c., *non* Benth.

Ononis excisa, Thunb. Fl. Cap. 586 (1823).

Humilis, diffusa, ad basin valde ramosa. *Ramuli* filiformes, minute pubescentes vel glabri. *Stipulæ* parvæ. *Folia* trifoliolata, foliolis obovatis oblongis vel supremis linearibus 5–10 mm. longis 3–6 mm. latis, adpresse pubescentibus, petiolo communi 5–8 mm. longo prædita. *Flores* mediocres, ad apicem pedunculorum solitarii vel gemini. *Bracteæ* parvæ. *Bracteolæ* angustæ. *Calyx* totus 6–7 mm. longus, dentibus acutis. *Vexillum* 10–11 mm. longum. *Alæ* carinam vix æquans. *Carina* 10–11 mm. longa, dorso rotundata, apice acuta. *Legumina* subsessilia, oblongo-cylindrica, minute vel adpresse pubescentia.

CAPE : Common near Cape Town, *Ecklon & Zeyher* ! Hb. Kew. ; Green Point, *Macowan*, Herb. Normale, No. 1832 ! Hb. Mus. Brit. ; Paarl and Groenekloof, *Drege* ! Cape Peninsula, *Wolley Dod* No. 1334 ! Hb. Mus. Brit. ; Sea Point, *Bolus* No. 2998 ! Hb. Mus. Brit. ; Sandy places on Olifants River, Clanwilliam, *Ecklon & Zeyher* ; Western Region, Hopefield, *Schlechter* No. 5330 ! Hb. Turic. ; Western Region, Rivierzonderend, *Schlechter* No. 5636 ! Hb. Turic.

274. C. ANGUSTISSIMA, *E. Mey. Comm.* 26 (1835) ; *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 576 ; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 42.

Tenuissima, diffusa, e basi valde ramosa. *Stipulæ* minutæ. *Folia* trifoliolata, foliolis angustissimis lineari-subulatis vel lineari-cuneiformibus 10–15 mm. longis subtus adpresse et tenuiter pubescentibus, petiolo communi 20–30 mm. longo prædita. *Flores* majusculi, sæpissime solitarii, rarius bini, apicem versus pedunculorum dispositi. *Corollam* non vidi, ex. cl. E. Meyer

incarnata est. *Calycis* tubus totus 6–7 mm. longus, laciniis lanceolatis. *Legumen* breviter stipitatum, oblongum, 16–20 mm. longum, pubescens.

CAPE: Sandy hills near Ebenezer, Stellenbosch, *Drege*! Hbb. Kew., Mus. Paris.

The leaflets of this plant are very narrow, and the flowers solitary or subsolitary.

275. C. EFFUSA, *E. Mey. Comm.* 25, ex parte (1835); *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 574; *Harvey, in Harvey & Sonder, Fl. Cap.* ii. 41.
Ononis racemosa, Thunb. Fl. Cap. 587 (1823).

Humilis, diffusa, ad basin copiose ramosa. *Rami* teretes, glabrescentes. *Stipulæ* minutæ. *Folia* trifoliolata, foliolis obovatis vel oblongis, 7–10 mm. longis 2·5–8 mm. latis subtus minute pubescentibus, petiolo communi 7–15 mm. longo prædita. *Flores* lutei, mediocres, in racemos pedunculatos laxe 3–6-floros dispositi. *Bracteæ* parvæ. *Pedunculi* sæpe 4–7 cm. longi. *Calyx* totus circ. 7 mm. longus, dentibus acutis. *Vexillum* obovatum. *Alæ* oblongo-ovatæ, carinæ subæquilongæ. *Carina* dorso rotundata, 10–11 mm. longa. *Legumen* subsessile, oblongum, adpresse pubescens.

CAPE: Sands near Karakuis, *Drege*! Hb. Mus. Brit.; Little Namaqualand, near Klipfontein, *H. Bolus* No. 432! Hb. Mus. Brit.; Piqueiniers Kloof, *Schlechter* No. 4925! Hb. Turic.; near Paarl, *Drege*! Hb. Mus. Brit.; Namaqualand, *W. C. Scully* No. 144! Hb. Mus. Brit.

Herbaceous, more robust and less branching than *C. excisa* and with a different inflorescence.

Dr. Schlechter distributed an interesting form with narrow leaflets from Windhoek, No. 8334! Hb. Turic.

276. C. ECKLONIS, *Harvey in Harvey & Sonder, Fl. Cap.* ii. 42 (1861–62).

Diffusa, sericea, gracilis, pubescens. *Stipulæ* lineari-lanceolatæ. *Folia* trifoliolata, foliolis lanceolatis supremis lineari-lanceolatis 20–36 mm. longis 2–3 mm. latis, utrinque adpresse pubescentibus, petiolo communi 10–40 mm. longo instructa. *Pedunculi* oppositifolii, sæpe 2-flori. *Flores* lutei. *Bracteolæ* 2, lineares, apicem versus pedicellorum positæ. *Calyx* 10 mm. longus, dentibus lineari-lanceolatis 5 mm. longis. *Carina* 13–14 mm. longa. *Ovarium* lineari-oblongum, circ. 7-ovulatum.

CAPE: In rocky places, Olifants River, Clanwilliam, *Ecklon & Zeyher*, Hb. Sonder; Clanwilliam, Herb. Austro-Africanum, *Macowan* No. 1833! Hb. Mus. Brit.; Clanwilliam, *C. L. Leipoldt* No. 729! Hb. Kew.

This is rather a doubtful species of *Crotalaria* tending towards *Lotononis*.

277. C. POLYCLADOS, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 17 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 197.

Herba annua; caulis centralis tenuiter strigoso-pubescens, erectus vel

abortivus, laterales prostrati, 8–12 cm. longi. *Stipulæ* parvæ, lineares. *Folia* trifoliolata, foliolis linearibus, 12–45 mm. longis sæpe 2–3 mm. latis, glabrescentibus subcarnosis, petiolo communi 5–8 mm. longo suffulta. *Flores* mediocres, pedunculati, solitarii. *Bracteolæ* 2, lineares, apicem versus pedicelli positæ. *Calyx* totus 7–8 mm. longus, laciniis tubo longioribus. *Vexillum* læte cæruleum, basi aurantiacum, vix emarginatum. *Alæ* apice viridi-cærulescentes, una margine aurantiacæ. *Carina* dorso rotundata, ±7 mm. longa, pallide luteo-virescens. *Legumen* turgidum, breviter stipitatum, cum stipite 15–16 mm. longum, glabrum, 10–12-spermum.

ANGOLA: Huilla, *Welwitsch* No. 1951! Hb. Mus. Brit.

Allied to *C. angustissima*, E. Meyer.

Series 65. Flores solitarii vel pauci. Carina dorso rotundata, circ. 12 mm. longa. Stipulæ lineares. Legumen oblongum, fusco-villosum. Frutex erectus.

278. C. ROTUNDICARINATA, *Bak. fil.*, sp. nov.

Frutex erectus, adspectu *C. Goetzei*, Harms, a qua primo intuitu stipulis linearibus facile distinguitur.

Ramuli pubescentes. *Folia* trifoliolata, foliolis oblanceolatis 15–40 mm. longis 5–14 mm. latis subtus pubescentibus, petiolo communi sæpius 3–8 mm. longo suffulta. *Flores* solitarii, bini vel pauci, pedicellati. *Calyx* 10–11 mm. longus, laciniis tubo longioribus; tubus circ. 3 mm. longus. *Vexillum* circ. 11 mm. longum, 13–14 mm. latum. *Carina* dorso rotundata, unguiculata, in toto circ. 12 mm. longa, rostro brevi. *Legumen* oblongum, fusco-villosum.

NYASALAND: *Buchanan* (1891) No. 821! Hb. Kew.

A shrub with trifoliolate leaves, oblanceolate leaflets and generally solitary or subsolitary flowers, a dorsally rounded carina, and oblong-villose pods.

Series 66. Flores lutei, pauci, apicem versus ramulorum dispositi. Carina dorso rotundata, circ. 10 mm. longa. Stipulæ parvæ. Legumen oblongum. Frutex erectus.

279. C. GAZENSIS, *Bak. fil. in Journ. Linn. Soc., Bot.* xl. (1911) 51.

Frutex ramis ramulisque tenuiter pubescentibus. *Folia* trifoliolata, foliolis utrinque pubescentibus oblanceolatis vel oblongo-oblanceolatis apice rotundatis et mucronatis, lateralibus 10–15 mm. longis, terminalibus usque ad 22 mm. longis, petiolo communi 3–6 mm. longo suffulta. *Pedicelli* tenues, pubescentes, bracteolis 2 minimis instructi. *Calycis segmentis* lanceolatis tubo longioribus. *Vexillum* circ. 10 mm. longum, calyce longius, unguiculatum.

Alæ oblongæ. *Legumen* extus pilis fulvis dense obtectum, calyce 3–4-plo longius, 20–22 mm. longum.

GAZALAND: Nyahodi River, *C. F. M. Swynnerton* No. 1493! Hb. Mus. Brit.

Series 67. Flores parviusculi, plerumque solitarii. Carina 4–7 mm. longa. Hujus seriei legumina mihi cognita oblonga, sessilia. Suffrutices virgati, foliis sessilibus vel subsessilibus.

280. C. LEPTOCLADA, *Harms in Baum, Kunene-Sambesi Exped.* 255 (1903).

Caules virgato-flexuosi, numerosi ex eadem radice orti. *Stipulæ* subnullæ. *Folia* sessilia, trifoliolata, foliolis lineari-lanceolatis vel lineari-oblongis apice acutis 2–8 mm. longis 1–2 mm. latis albo-pubescentibus. *Flores* parviusculi, sæpissime solitarii. *Pedicelli* 4–10 mm. longi, filiformes. *Bracteolæ* lineares. *Calycis laciniæ* lanceolatæ; calyx totus 4–4·5 mm. longus. *Vexillum* calyce longius. *Alæ* oblongæ, ± 5 mm. longæ. *Carina* dorso rotundata vel genuflexa. *Legumen* oblongum, subsessile, 8–10 mm. longum, pubescens.

ANGOLA: On the Longa, *Baum* No. 829! Hb. Berol., etc.; Kassuango, Kuiriri, *Gossweiler* 1402! Hb. Mus. Brit.

The slender filiform stems, the sessile leaves, the solitary flowers and the oblong sessile pods are the distinguishing features of this plant.

281. C. HARMSIANA, *Taubert in Engl. Pflanzenwelt Ost-Afr.* C. 205 (1895).

Suffrutex ramosissimus, habitu *C. cistoidei*, Welw., simillimus, circ. 6 dm. longus. *Stipulæ* vix conspicuæ. *Folia* sessilia vel subsessilia, foliolis subcoriaceis oblanceolatis 10–15 mm. longis 3–4 mm. latis, petiolo 1–2 mm. longo suffulta. *Flores* mediocres, solitarii vel gemini. *Calyx* circ. 4–5 mm. longus. *Vexillum* extus pilis obtectum, circ. 8 mm. longum et 6 mm. latum. *Carina* dorso rotundata, calyce longior, cum unguibus ± 9 mm. longa. *Legumen* oblongum, 15–16 mm. longum, subsessile, hirtum.

UGANDA: Buddu, *Dawe* Nos. 313! 328! Hb. Kew.

GERMAN EAST AFRICA: Bukoba, *Stuhlmann* Nos. 3941! 4099! 4103! Hb. Berol.

282. C. SYLVICOLA, *Bak. fil.*, sp. nov.

Suffrutex humilis, ramosus. *Rami* foliosi, brunneo-tomentosi, 5–15 cm. longi. *Stipulæ* oculo nudo non conspicuæ. *Folia* sessilia, foliolis ovato-oblongis intermediis quam lateralibus longioribus 9–13 mm. longis 3–4 mm. latis, margine pilis obtectis subtus conspicue nervosis. *Flores* parviusculi, ad apices ramorum pedunculati, solitarii. *Bracteæ* hirtæ, angustæ, infra medium pedicelli positæ, circ. 2–5 mm. longæ. *Calyx* hirtus, 6–7 mm. longus, laciniis tubo longioribus. *Vexillum* suborbiculari-obovatum, dorso pilosum. *Alæ*

carinæ subæquilongæ. *Carina* dorso rotundata, apice haud rostrata, 6–7 mm. longa. *Ovarium* lineari-oblongum. *Legumen* ignotum.

ANGOLA: In the Mumua Woods at Kutchi. In flower Nov. 1906. *Gossweiler* No. 3547! Hb. Mus. Brit.

Allied to *C. cistoides*, Welw.

283. C. SUBSESSILIS, *Harms in Baum, Kunene-Sambesi Exped.* 256 (1903).

Suffrutex erectus. *Caulis* elongatus, virgatus. *Stipulæ* circ. 1 mm. longæ. *Folia* trifoliolata, foliolis subcoriaceis subtus strigoso-pubescentibus lineari-oblanceolatis 7–22 mm. longis sæpissime 1·5–3·0 mm. latis, petiolo communi brevissimo. *Flores* mediocres, pauci, plerumque solitarii. *Pedicelli* graciles. *Bracteolæ* lineares, apicem versus pedicelli positæ. *Bracteæ* lineares. *Calyx* extus pubescens, 6–7 mm. longus, laciniis tubo longioribus. *Vexillum* obovatum, extus apice pilosum. *Carina* dorso rotundata, in toto 6–7 mm. longa, apice acuta, unguiculata. *Legumen* oblongum, pubescens, 12–15 mm. longum.

ANGOLA: Onschingue, *H. Baum* No. 787! Hb. Turic. etc.; Campulua, *Gossweiler* No. 2784! Hb. Mus. Brit.

A virgate suffrutex, with narrow, subsessile leaves, and few flowers.

Series 68. Flores mediocres, axillares, pauci 1–2. Carina dorso rotundata, 9–12 mm. longa. Stipulæ parvæ. Legumen immaturum, oviforme. Suffrutex foliis in typo subsessilibus, in var. *gweloense* petiolatis.

284. C. SERICIFOLIA, *Harms in Baum, Kunene-Sambesi Exped.* 255 (1903).

Suffrutex ramosus, 1·0–1·3 m. altus. *Folia* subsessilia, trifoliolata, foliolis cuneato-obovatis, 6–20 mm. longis 4–12 mm. latis subcoriaceis, junioribus utrinque sericeis, adultioribus superne glabris et nitidis subtus tomentosis. *Flores* mediocres. *Bracteolæ* lineares. *Calyx* extus sericeus, in toto circ. 10 mm. longus; laciniæ lanceolatæ, tubo longiore. *Vexillum* intus pallide cæruleum. *Alæ* oblongæ. *Carina* dorso rotundata, apice in rostrum attenuata, 9–12 mm. longa. *Legumen* immaturum, oviforme, pubescens.

ANGOLA: Habungo, *Baum* No. 483! Hb. Berol.; no precise locality, *Gossweiler* 2993! Common along the river Kuoa Quembo, *Gossweiler* No. 3374! In a mixed wood near the Rio Cambambe, Cuebe, *Gossweiler* No. 2608! In an open shrub-grown wood near Micango, Kuiriri, *Gossweiler* No. 2543! Hb. Mus. Brit.

Var. nov. GWELOENSIS, *Bak. fil.*

Folia longiuscule petiolata, foliolis coriaceis cuneato-obovatis, petiolo

communi 3–5 mm. longo suffulta. *Flores* longius pedunculati. *Legumen* oviforme, pubescens, 12–13 mm. longum.

RHODESIA : Gwelo District, *Dr. R. F. Rand* No. 50 ! Hb. Mus. Brit. In flower and fruit Jan. 1898. In woods.

Mr. Gossweiler describes the typical forms as a suffruticose and much branched undershrub, frequently 4 ft. high, with leaves olive-green above and silvery white and tomentose below. Standard violet-blue or pale blue inside. Wings and keel yellowish.

Series 69. Flores mediocres, 1–3 apicem versus pedunculorum dispositi. Carina in toto 6–8 mm. longa. Stipulæ parvæ, lineari-lanceolatæ. Legumen subsessile, cylindricum, piloso-hirtum. Suffrutex ramis pilis patentibus obtectus.

285. C. LOTOIDES, *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 575 ; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 42.

Suffrutex ramosus, prostratus vel decumbens, ramulis ferrugineo-pubescentibus et patentim pilosis. *Folia* trifoliolata, foliolis obovatis circ. 12 mm. longis subtus vel utrinque pilosis, petiolo ± 12 mm. longo suffulta. *Pedunculi* oppositifolii, folio parum longiores. *Bracteolæ* ad basin calycis conspicuæ. *Calyx* pilosulus, ± 7 mm. longus, dentibus lanceolatis tubo longioribus. *Carina* in toto 6–8 mm. longa, calyce longior, rostro rectiusculo. *Legumen* piloso-hirtum, 24–32 mm. longum.

TRANSVAAL : Macaliesberg and Aapjes River, *Burke* ! Hb. Kew.; Pietersberg, *Bolus* No. 11025 ! Hb. Kew. ; Makapansberg, *Rehmann* No. 5535 ! Hb. Turic. ; Houtbosch, *Rehmann* No. 6256 ! Hb. Kew.

GRIQUALAND : Kimberley, *Rehmann* Nos. 3460 ! and 3456 ! Hb. Turic.

BECHUANA COUNTRY : Bongquaketse Territory, nr. Mohaneng, *Dr. Holub* ! Hb. Kew.

CAPE : Near Grahamstown, *Ward* ! Hb. Kew.

Series 70. Flores 1–3-ni. Carina 6–8 mm. longa, dorso rotundata, apice acuta, plus minusve falcata. Stipulæ minutæ, caducæ. Legumina oblongo-obovata, pubescentia, breviter stipitata. Suffrutex ramosus.

286. C. PAUCIFLORA, *Baker in Kew Bull.* (1897) 251.

Erectus. Folia trifoliolata, foliolis obovatis obtusis mucronatis 4–10 mm. longis, petiolo communi 3–6 mm. longo suffulta. *Flores* solitarii vel 1–3-ni. *Pedicelli* cernui, pubescentes. *Calyx* pilosus, ± 6 mm. longus, dentibus lanceolatis. *Corolla* calyce fere duplo longior. *Carina* dorso rotundata.

Legumen oblongo-obovatum, oligospermum, 10–11 mm. longum, apice mucronatum.

NYASALAND: Nyika Plateau, alt. 2000–2300 metr., *Whyte*! Hb. Kew.

This shrub has few flowers and oblong-obovate, inflated, pubescent pods.

Series 71. Flores parviusculi, pedunculis 1-floris oppositifoliis. Carina ± 7 mm. longa. Stipulæ non conspicuæ. Legumen quam calyx parum longius. Herbacea.

287. C. SPARSIFLORA, *E. Mey. Comm.* 26 (1835); *Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 573; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 41.

Pusilla, diffusa. *Caulis* tenuis, sericeo-canescens. *Folia* trifoliolata, foliolis anguste obovatis 5–7 mm. longis 3–4 mm. latis sericeo-canescentibus, petiolo communi 4–8 mm. longo suffulta. *Flores* parviusculi. *Pedunculi* quam petioli breviores. *Bracteæ* parvæ, angustæ. *Calyx* sericeo-canescens, 6–6·5 mm. longus; laciniæ lanceolatæ. *Carina* ± 7 mm. longa, quam calyx longior, apice in rostrum attenuata. *Legumen* ± 6 mm. longum, sericeo-argenteum.—Accedit *Lotononidibus* sectionis *Oxydii* sed ob carinam longe rostratam potius inter *Crotalariis* enumero.

NAMAQUALAND: Hills on the Gariep near Veleptram, *Drege* No. 3328! Hb. Turic.

A small sericeo-canescent plant, with one-flowered peduncles and pods only very slightly longer than the calyx.

Series 72. Flores mediocres, apicem versus pedunculorum positi. Carina dorso rotundata, 7–12 mm. longa. Stipulæ parvæ, lineares. Legumina oblonga, cinereo- vel fusco-tomentosa. Suffrutices ramis diffusis, foliis petiolatis.

288. C. VARIEGATA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 19 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 198.

Suffrutex. Rami diffusi, flexuosi, 0·5–1 m. longi, cinereo-tomentosi. *Stipulæ* circ. 3 mm. longæ. *Folia* trifoliolata, utrinque præcipue subtus cinereo-hirta, foliolis obovatis ovatis vel ellipticis 20–35 mm. longis 10–18 mm. latis, petiolo communi 4–7 mm. longo suffulta. *Pedunculi* 1–3-flori. *Pedicelli* 3–5 mm. longi. *Calyx* cinereo- vel fusco-tomentosus, laciniis lanceolatis tubo longioribus, in toto 6–7 mm. longus, fructifer ± 8 mm. longus. *Vexillum* extus hirsutum. *Corolla* calyce longior. *Vexillum* violaceum. *Alæ* flavæ. *Carina* flava, circ. 7 mm. longa. *Legumen* sessile, oblongum, 8–10 mm. longum.

ANGOLA: Huilla, *Welwitsch* No. 1968! Hb. Mus. Brit.; Huilla, *Antunes & Dekindt* No. 3202! Hb. Mus. Paris.

A plant with perennial root, and several stems spreading all round. Keel and wings yellow, standard deep violet.

289. C. RHODESIÆ, *Bak. fil.*, sp. nov.

Radix perennis. *Caules* plures, ex eadem radice orti, diffusi, flexuosi, 20–35 cm. longi. *Stipulæ* parvæ, lineares. *Folia* trifoliolata, foliolis glauco-viridibus ellipticis vel obovatis 10–22 mm. longis 6–10 mm. latis, petiolulis brevibus, petiolo communi 6–9 mm. longo suffulta. *Flores* mediocres, in racemos laxos axillares breves dispositi. *Racemi* sæpe 2-flori. *Pedicelli* 2–3 mm. longi, minute bibracteolati. *Calyx* extus pubescens, circ. 10 mm. longus, dentibus lanceolatis, circ. 6 mm. longis. *Vexillum* suborbiculari-obovatum, calyce longius, 10–12 mm. longum. *Carina* circ. 12 mm. longa, apice acuta. *Legumen* sessile, oblongo-oviforme, 20–22 mm. longum, demum glabrescens.

N.W. RHODESIA: Kalomo, in sand, *F. A. Rogers* No. 8214! Hb. Kew.

The wings are about 11 mm. long and 5·5 mm. broad.

A perennial with several diffuse flexuous stems, a lax few-flowered raceme, a carina rounded on the back, acute, scarcely rostrate, and an oblong, oviform, sessile pod. Allied to *C. variegata*, Welw.

Series 73. Flores parviusculi, solitarii vel pauci, pedicellati. Carina dorso genuflexa, 6–8 mm. longa. Stipulæ setaceæ, patulæ. Legumen oblongum, subsessile. Herbacea.

290. C. MICROPHYLLA, *Vahl, Sym. Bot.* i. 52 (1790); *DC. Prod.* ii. 134; *Baker in Oliver, Fl. Trop. Afr.* ii. 16; *Chiovenda in Ann. Ist. Bot. Roma,* viii. (1903) 82.

C. pumila, Hochst. et Steud. in Schimp. Pl. Arab. No. 788.

Caulis herbaceus, decumbens, filiformis, 10–20 cm. longus, teres, glaber vel strigoso-pubescens. *Folia* trifoliolata, foliolis oblongis vel oblongo-obovatis 3–10 mm. longis 2·5–5 mm. latis, intermediis majoribus, superne glabris subtus tenuiter sericeis, petiolo communi 2–5 mm. longo suffulta. *Flores* sæpius solitarii vel bini. *Bracteæ* binæ, subulatæ. *Corolla* flava, calyce duplo longior. *Calycis* laciniæ pilosiusculæ, lanceolatæ. *Vexillum* carina brevius. *Carina* dorso genuflexa, inde in rostrum sensim attenuata. *Legumen* oblongum, 8–12 mm. longum, pubescens.

SUDAN: Nubia, *Schweinfurth* Nos. 1883! 1884! Hb. Berol.; Nubia, *T. Bent*, Hb. Kew.; Getena, White Nile, *Schweinfurth* No. 910! Hb. Kew.

ERITREA: Massua, Samhar, *Hildebrandt* No. 729! Hb. Mus. Brit.; Near Saati, *Schweinfurth & Riva* No. 343! Hb. Turic.; Dahalah Archipelago,

Terraciano Nos. 183 ! 184 ! Hb. Roma ; Samhar, *Cocastelli* Nos. 27 ! 118 ! *Ragazzi & Pappi* Nos. 1745 ! 1770 ! *Terraciano & Pappi* No. 27 ! *Pappi* Nos. 1744 ! 1746 ! Assaorta, *Pappi* Nos. 69 ! 110 ! *Terraciano* No. 24 ! Hb. Roma.

The type was described from Arabia Felix. This species also occurs on the Comoro Is., *Humblot* No. 1008.

Series 74. Flores parvuli, in racemos abbreviatos vel in capitula sæpius 2–4-flora dispositi, vel flores interdum solitarii. Carina 5–6 mm. longa. Stipulæ minutæ. Legumina oblonga. Herba gracilis, rarissime suffruticulosa.

291. C. MICROCARPA, *Hochst. ex Benth. in Hook. Lond. Journ. Bot.* ii. (1843) 573 ; *Baker in Oliver, Fl. Trop. Afr.* ii. 16 ; *Chiovenda in Ann. Ist. Bot. Roma*, viii. (1903) 401.

C. triantha, Steud. in Schimp. Pl. Abyss. No. 1190, *non* DC.

C. lotoides, A. Rich. Tent. Fl. Abyss. i. 157 (1847), *non* Benth.

Maria Antonia orientalis, Parlatore, Mar. Ant. Nov. Gen. 3 (1844).

C. Mariæ Antoniæ, Aschers. ex Baker, l. c.

C. Dorycnium, A. Rich. ex Baker, l. c.

C. polychotoma, Taubert, Gliederung d. Vegetation von Usambara (1894), 18 & 24.

Herba dichotome ramosa, habitu *Dorycnii*. *Caules* herbacei, diffusi, tenues, ramosi. *Stipulæ* deciduæ, setaceæ. *Folia* trifoliolata, foliolis cuneato-oblongis 5–15 mm. longis 2–5 mm. latis, supra glabris subtus sericeo-pilosis, petiolo communi brevissimo. *Flores* parvuli. *Bracteæ* setaceæ, sericeæ. *Bracteolæ* ad basin calycis setaceæ. *Calyx* totus 3–3·5 mm. longus ; laciniæ pilosæ. *Corolla* flava. *Vexillum* calyce duplo longius. *Carina* dorso angulo recto curvata, apice in rostrum gracilem attenuata, 5–6 mm. longa. *Legumina* sessilia, obovato-oblonga, sericea, circ. 8-sperma.

NIGERIA : Nupe, *Barter*, Hb. Kew.; Katagum District, *Dalziel* No. 17 ! Hb. Kew.

NORTH CAMEROONS : *P. Talbot* No. 1413 ! Hb. Mus. Brit.

SUDAN : Kordofan, *Kotschy* No. 97 ! Hb. Mus. Brit. ; Darfur, *Dr. Pfund*, Hb. Turic. ; Matamma, *Schweinfurth* Nos. 1878 ! 1879 ! Hb. Schweinfurth.

ERITREA : Bogos, Dembelas and Medri od Tesfa, *Chiovenda*, Hb. Roma.

ABYSSINIA : Near Gafta, *Schimper* (1842) No. 1190 ! Hb. Mus. Brit.

GERMAN EAST AFRICA : Usambara, *Holst* No. 3219 ! Hb. Berol., and *Holst* No. 2473 ! Hb. Berol.

BRITISH EAST AFRICA : South Mombassa to Shimoni, *Whyte* ! Hb. Mus. Brit.

NYASALAND : *Buchanan* (1895) No. 422 ! Hb. Mus. Brit.

N.W. RHODESIA : *Rogers* No. 8246 ! Hb. Kew.

Forma SUBUNIFLORA, *Steud. in Schimp. Herb. Abyss.* No. 1965.
Flores sæpissime solitarii. *Pedicelli* longiores.
ABYSSINIA: Near Djeladjeranne, *Schimper* (1844) No. 1965! Hb. Mus. Brit., etc.

Var. nov. DAWEI, *Bak. fil.*
Suffruticulosus, diffusus, ramosus, ramis 15–20 cm. longis. *Folia* trifoliolata, subsessilia, vel brevissime petiolata. *Bracteæ* parvæ. *Racemi* breves pauciflori. *Flores* parvi. *Carina* dorso angulo recto curvata, inde in rostrum gracilem attenuata, in toto 5–6 mm. longa.
SUDAN: Bari Country, *Dawe* No. 892! Hb. Kew.
This is a diffuse perennial, with few-flowered racemes, and small flowers; the carina is 5–6 mm. long.

Var. nov. SUDANICA, *Bak. fil.*
Annua gracilis, humilis, ramosa. *Folia* cinerea, foliolis 5–7 mm. longis, angustioribus. *Racemi* laxe 2–3-flori, capitato-congesti. *Carina* dorso angulo recto curvata, in toto 5–6 mm. longa. *Legumen* sessile, subglobosum.
SUDAN: S. Kordofan, *Mr. and Mrs. A. F. Broun* No. 1354! Hb. Kew.
This is a slender little plant, with narrow cinerous leaves; the racemes are lax, and 2–3-flowered.

SUBSECT. 5. STIPULOSÆ.

Stipulæ foliaceæ (in *C. damarense*, Engler, angustæ). Flores sæpius in racemos dispositi, rarius solitarii vel gemini.

CLAVIS SPECIERUM.

1.	Flores in racemos dispositi	2
	Flores solitarii vel gemini	13
2 (*a*)	Carina 16–23 mm. longa	3
(*b*)	Carina 11–15 mm. longa	7
(*c*)	Carina 6–10 mm. longa	12
3.	Legumina oblongo-cylindrica, sessilia, indumento dense obtecta.	*lachnocarpa.*
	Legumina cylindrica, oviformia vel oblonga, stipitata	4
4.	Stipulæ petiolulatæ, obovatæ	*capensis.*
	Stipulæ non petiolulatæ	5
5.	Stipulæ semilunatæ	*natalitia.*
	Stipulæ lanceolatæ vel falcato-lanceolatæ	6
6.	Erecta, elata patentim rufo vel fusco-pilosa. Foliola elliptica vel oblonga	*podocarpa,* subsp. *Belckii.*
	Erecta, pilis patentibus induta. Foliola glauco-viridia, anguste lineari-oblonga vel lineari-lanceolata	*mutabilis.*
	Erecta ubique pilosa. Foliola oblongo-oblanceolata vel anguste oblonga	*fulgida.*

7	Stipulæ semilunatæ	8
	Stipulæ non semilunatæ	9
8.	Decumbens. Caules pilis brunneis patentibus induti	*decumbens.*
	Erecta, rami angulares, pubescentes	*natalitia.*
9.	Stipulæ obcordatæ, magnæ	*cordata.*
	Stipulæ non obcordatæ	10
10.	Stipulæ ovatæ basi inæqualiter cordata, petiolulatæ. Caulis glaber	*xanthoclada,* var. *Stolzii.*
	Stipulæ lanceolatæ vel falcato-lanceolatæ vel angustæ	11
11 (*a*)	Caulis herbaceus, hispidus. Foliola oblonga vel obovata. Flores pauci. Carina 13–16 mm. longa	*podocarpa.*
(*b*)	Annua, e basi ramosa, breviter villosa. Foliola cuneato-oblonga vel oblongo-obovata. Flores pauci. Carina 12–14 mm. longa..	*podocarpa,* var. *villosa.*
(*c*)	Erecta, e basi ramosa, ubique patentim pilosa vel hirta. Foliola oblongo-elliptica. Carina ±15 mm. longa	*podocarpa,* subsp. *flexuosa.*
(*d*)	Erecta, e basi ramosa, strigoso-pubescens, demum sæpe glabrescens. Foliola oblongo-lanceolata vel oblongo-obovata. Carina 13–14 mm. longa	*Fleckii.*
(*e*)	Erecta, pilis patentibus induta. Foliola glauco-viridia, anguste lineari-oblonga vel lineari-lanceolata. Carina 14–16 mm. longa	*mutabilis.*
(*f*)	Suffrutex e basi ramosus, hirsutissimus. Foliola oblanceolata vel oblongo-oblanceolata. Carina circ. 14 mm. longa	*hirsutissima.*
(*g*)	Herba longe pilosa, a medio ramosa. Foliola oblongo-lanceolata. Carina 14–15 mm. longa	*Marlothii.*
(*h*)	Erecta, ramosa, ubique cinereo-pilosa. Foliola lineari-oblonga. Carina 10–12 mm. longa	*damarensis.*
12 (*a*)	Folia mediocriter petiolata, foliolis cuneato-oblongis. Legumina 10–18 mm. longa	*goreensis.*
(*b*)	Foliola longiuscule petiolata, foliolis ellipticis oblongis vel ovato-ellipticis. Legumina 15–18 mm. longa	*goreensis,* subsp. *macrostipula.*
(*c*)	Foliola longiuscule petiolata, foliolis elliptico-oblongis. Legumina 25–30 mm. longa	*cylindrocarpa.*
13.	Caulis glaber	*ervoides.*
	Caulis non glaber	14
14.	Hirsuta. Legumen stipitatum glabrum non subcompressum ..	*podocarpa.*
	Pilis albidis vestita. Legumen subcompressum, ovale	*erisemoides.*

Series 75. Flores majusculi, in racemos pauci vel plurifloros laxos dispositi. Carina rotundata vel leviter angulata, 16–23 mm. longa. Stipulæ foliaceæ, semioblongæ, semiovatæ vel semilunatæ. Legumina oblongo-cylindrica, sessilia, indumento denso et plus minusve sericeo induta. Frutices vel suffrutices erecti.

292. C. LACHNOCARPA, *Hochst. in Schimp. Pl. Abyss.* No. 780 ; *Baker in Oliver, Fl. Trop. Afr.* ii. 33 (1871) ; *Taubert in Engl. Hochgebirgsflora,* 245 ; *Hiern, Cat. Welw. Afr. Pl.* i. 202.

C. lachnophora, Hochst. ex Richard, Tent. Fl. Abyss. i. 151 (1847).

C. elata, Welw. ex Baker in Oliver, l. c. ii. 29; Hiern, Cat. Welw. Afr. Pl. i. 201 (1896); (sphalm. *alata*), De Wild. Notes sur le Fl. de Katanga, 52.

C. arborescens, Welw. Apont. 590, No. 93, *non* Lam.

C. grandistipulata, Harms in Engl. Jahrb. xxviii. (1900) 399.

Frutex vel suffrutex validus, ramosus, rufo-tomentosus, striatus. *Folia* trifoliolata, foliolis cuneato-obovatis vel cuneato-oblongis 20–45 mm. longis 10–20 mm. latis, præcipue subtus strigoso-pubescentibus, petiolo communi 12–35 mm. longo suffulta. *Flores* sæpissime in racemos breves dispositi, pedicellati. *Bracteæ* caducæ. *Calyx* extus dense ferrugineo-tomentosus; laciniæ lanceolatæ, laciniæ una inferiori carinæ adpressa, lateralibus per paria approximatis. *Vexillum* calyce longius. *Alæ* primum sulphureæ, mox aurantiaco-croceæ. *Carina* subcymbæformis, apice in rostrum attenuata. *Legumina* densissime ferrugineo-tomentosa, 25–35 mm. longa, multisperma.

Very widely distributed in Tropical Africa. Occurs in Cameroons and Togoland, Abyssinia and British East Africa, Lower Guinea, especially in Angola and on the Longa, German East Africa in Uhehe and Tanganyika, and in Nyasaland and in Gazaland near Chirinda.

Var. STRICTISSIMA, *Hiern, Cat. Welw. Afr. Pl.* i. 202 (1896).

Caulis strictissimus. *Flores* majusculi, pauci. *Foliola* oblongo-oblanceolata.

ANGOLA: Huilla, *Welwitsch* No. 1965! Hb. Mus. Brit.

Var. nov. MELANOCALYX, *Bak. fil.*

Frutex sec. cl. detectorem 1·5 m. alt. attingens. *Foliola* oblanceolata vel oblongo-oblanceolata 30–45 mm. longa 9–14 mm. lata, petiolo communi 5–8 mm. longo. *Calyx* nigro-tomentosus, 15–17 mm. longus. *Carina* cum unguibus circ. 23 mm. longa.

CAMEROONS: Djutitas, *C. Ledermann* No. 1788! Hb. Berol.

Series 76. Flores majusculi, in racemos laxos breves pluri- vel multifloros dispositi. Stipulæ foliaceæ, petiolulatæ, obovatæ, rarius obsoletæ. Carina dorso rotundata, circ. 17–19 mm. longa. Legumen stipitatum cylindricum.

293. C. CAPENSIS, *Jacq. Hort. Vindob.* iii. 36, t. 64 (1776–77); *Harvey in Harvey & Sonder, Fl. Cap.* ii. 46; *Wood, Natal Plants*, tab. 92; *Bolus & Wolley Dod, Fl. Plants and Ferns of Cape Peninsula*, 255.

C. arborescens, Lam. Encycl. ii. 199 (1786); DC. Prod. ii. 130.

C. incanescens, Linn. fil., Suppl. 323 (1781).

C. laburnifolia, Miller, Dict. ed. VIII. (1768), *non* Linn.

Frutex usque ad 1·3–1·6 m. alt. *Rami* teretes, adpresse sericei. *Folia* trifoliolata, foliolis late obovatis vel oblongo-obovatis obtusis vel mucronulatis glabris vel minute pubescentibus, petiolo pubescente suffulta. *Racemi* terminales vel oppositifolii, laxe multiflori. *Flores* lutei. *Bracteæ* ad basin pedicelli lineares. *Bracteolæ* in medio pedicelli lineares. *Calycis tubus* pubescens, dentibus lanceolatis acuminatis. *Vexillum* luteum, lineis percursum, calyce duplo longius. *Alæ* oblongæ. *Carina* apice incurva, unguiculata, sæpius 17–19 mm. longa. *Legumen* cylindricum vel oblongo-cylindricum, cum stipite 4–5 cm. longum.

SOUTH AFRICA: Eastern Districts, common, many collectors. Introduced as an ornamental plant into Cape Peninsula and now naturalised.

PORTUGUESE EAST AFRICA: Delagoa Bay, *Junod* No. 507! Hb. Schinz; Between Beira and Massi Kessi, *Mrs. Evelyn Cecil*! Hb. Kew.

Introduced into cultivation by Francis Masson in 1774.

The var. *β. obscura*, E. Mey., Com. 23, from near Enon, was diagnosed "foliis saturate viridibus," but, judging from herbarium material, is not markedly different from the typical form.

Series 77. Flores mediocres vel sat ampli, lutei vel rarius cærulei, in racemos paucifloros vel plurifloros dispositi, rarius solitarii. Carina dorso genuflexa, 10–18 mm. longa. Stipulæ ± foliaceæ vel rarius ut in *C. Fleckii*, Schinz, parvæ, interdum caducæ, et in *C. damarense*, Engler, angustæ. Hujus seriei legumina mihi cognita oblonga, glabra, stipitata. Herbæ vel suffrutices, pilis ± induti rarius demum glabrescentes.

294. C. PODOCARPA, *DC. Prod.* ii. 133 (1825); *Guill. & Perr. Fl. Seneg.* 166; *Benth in Hook. Lond. Journ. Bot.* ii. (1843) 589; *Baker in Oliver, Fl. Trop. Afr.* ii. 17.

C. arvensis, Klotzsch in Peters' Mossamb. Bot. 53 (1862).

C. pilifera, Klotzsch, l. c. 54.

C. physocarpa, Fenzl ex Baker in Oliver, l. c. ii. 17 (1871).

Caulis herbaceus, erectus, e basi vel sursum divaricato-ramosus, hispidus. *Stipulæ* foliaceæ, falcatæ, erectæ. *Folia* trifoliolata, foliolis obovatis vel oblongis obtusis mucronatis, sæpe 10–40 mm. longis 3–8 mm. latis, glabris subtus pilis longis raris obtectis, petiolo communi 10–25 mm. longo suffulta. *Flores* sat ampli, flavi, in racemos oppositifolios vel terminales paucifloros dispositi vel rarius subsolitarii. *Bracteæ* parvæ. *Bracteolæ* lineares, apicem versus pedicelli positæ. *Calyx* hispidus, profunde quinque partitus, segmentis lineari-lanceolatis fere æqualibus. *Vexillum* ovale, circ. 10–13 mm. longum, pallide flavum. *Alæ* vexillo vix minores. *Carina* rostriformis,

naviculariformis, vexillo superans, 15–18 mm. longa, pallide flavescens. *Legumen* oblongum, 16–26 mm. longum, stipite 4–6 mm. longo suffultum, glabrum, 12–18 ± spermum.

This species is widely spread in Eritrea, Abyssinia, Upper Guinea, German and Portuguese East Africa, Angola, German South-west Africa, and North Rhodesia. The type was collected on the Plains of the Walo country about Richard Tol and beyond the river on the borders of the Sahara desert, *Leprieur and Perrottet* No. 167 !

C. arvensis, Klotzsch, is a diffuse, very branched plant with cuneate-oblong leaflets. It was collected at Rios de Sena, Mozambique. It was also collected by *Menyharth* No. 1009 in Boruma.

C. pilifera, Klotzsch, has elliptical leaflets, and is erect, very branched, and densely pilose. It comes from Mesuril and Cabaceira in Mozambique.

Var. VILLOSA, *Schinz in Verhandl. Bot. Ver. Brand.* xxx. (1889) 160.

Annua, e basi ramosa, breviter villosa. *Foliola* cuneato-oblonga vel oblongo-obovata, 12–25 mm. longa 5–6 mm. lata. *Flores* mediocres, subsolitarii. *Legumen* oblongum, glabrum.

AMBOLAND : Olukonda, *Rautanen* No. 369 ! Hb. Turic.

A slender annual, with subsolitary flowers and cuneate-oblong leaves.

Subsp. C. FLEXUOSA, *Baker in Oliver, Fl. Trop. Afr.* ii. 29 (1871), pro sp.

Erecta, herbacea, e basi ramosa, 20–30 cm. alta, ubique patentim pilosa vel hirta. *Stipulæ* foliaceæ, falcatæ. *Foliola* oblongo-elliptica, elliptica vel oblongo-obovata, 20–40 mm. longa 7–14 mm. lata, petiolo communi 12–30 mm. longo. *Flores* mediocres, in racemos paucifloros dispositi. *Bracteæ* lineares. *Calycis laciniæ* lanceolatæ, tubo longiores. *Vexillum* carinæ fere æquilongum. *Carina* dorso genuflexa, circ. 15 mm. longa. *Legumen* oviforme, ±20 mm. longum, glabrum; stipes 3–4 mm. longus.

SOUTH CENTRAL : In the interior near the Tropic, *Chapman & Baines* ! Hb. Kew.

NGAMILAND : Kwebe Hills, *Mrs. E. J. Lugard* No. 179 ! Hb. Kew.

PORTUGUESE EAST AFRICA : Zambesiland, *Kirk* ! Hb. Kew.

Very closely allied to *C. podocarpa*, DC. ; type differs in being more hairy, etc.

On the sheet of the type there is an admixture of two species, the pod being that of *C. hispida*, Schinz.

Subsp. C. BELCKII, *Schinz in Bot. Ver. Brand.* xxx. (1888) 159, pro sp.

Erecta, elata, ramosa, patentim rufo vel fusco-pilosa, circ. 5–6 dm. alta. *Stipulæ* foliaceæ, conspicuæ, 16–22 mm. longæ, acutæ. *Foliola* elliptica,

oblonga vel ovata, petiolo communi 30–35 mm. longo. *Flores* saturate lutei, majusculi nunc in racemos breves densifloros nunc in racemos ± elongatos. *Bracteæ* angustæ, caducæ. *Calyx* totus 12–13 mm. longus; laciniæ lanceolatæ. *Vexillum* 16–18 mm. longum. *Alæ* oblongæ, carinæ subæquilongæ. *Carina* dorso genuflexa, 16–18 mm. longa. *Legumen* oblongum, circ. 28 mm. longum, glabrum; stipes 3–4 mm. longus.

HEREROLAND: Kaokofeld, Franzfontein, *Belck* No. 24! Spitzkoppjes, *C. Dinter*! Okahandja, *Dinter* No. 6! Hb. Turic.

TRANSVAAL: Boschveld, *Rehmann* No. 5179! Hb. Turic.

295. C. FULGIDA, *Baker in Oliver, Fl. Trop. Afr.* ii. 32 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 202.

Annua, ramosa, ramis pilosis. *Stipulæ* falcato-lanceolatæ. *Folia* trifoliolata, foliolis oblanceolatis vel anguste oblongis, intermediis 20–35 mm. longis 4–5 mm. latis, lateralibus paullo minoribus, petiolo communi 8–20 mm. longo suffulta. *Flores* lutei, fulgidi, in racemos laxos sæpius 3–8-floros dispositi. *Calycis tubus* campanulatus, dentibus acuminatis. *Vexillum* calyce longius. *Alæ* oblongæ, unguiculatæ. *Carina* dorso angulata, apice in rostrum attenuata, 15–18 mm. longa. *Legumen* ignotum.

ANGOLA: Mossamedes, *Welwitsch* No. 1977! Hb. Mus. Brit.

"A copiously flowering plant, cheering the sandy deserts with its brilliant yellow flowers."

296. C. FLECKII, *Schinz in Mém. Herb. Boiss.* No. 1, 128 (1900).

Herba e basi ramosa, strigoso-pubescens vel strigoso-hirsuta, interdum subglabra, *C. podocarpæ*, DC., affinis. *Stipulæ* foliaceæ vel interdum parvæ. *Folia* trifoliolata, foliolis subtus strigoso-hirsutis oblongo-lanceolatis vel oblongo-obovatis, 15–32 mm. longis 5–10 mm. latis, petiolo communi 7–15 mm. longo suffulta. *Flores* lutei, mediocres, in racemos paucifloros dispositi. *Bracteæ* parvæ. *Calyx* circ. 8 mm. longus; laciniæ acuminatæ. *Vexillum* luteum. *Alæ* oblongæ. *Carina* dorso genuflexa, 13–14 mm. longa, lutea. *Legumen* oblongum, cum stipite 20–28 mm. longum, glabrum.

HEREROLAND: Kuisib, *Fleck* No. 455! Hb. Turic.

GREAT NAMAQUALAND: Rehoboth, *Fleck* Nos. 167! 447! 937!; Kuddib, *Fleck* No. 453! Hb. Turic.

297. C. MUTABILIS, *Schinz in Bull. Herb. Boiss.* sér. II. iii. (1903) 820; *Schinz in Viertelj. Nat. Ges. Zürich*, lii. (1907) 422.

Erecta, ramosa, 40–70 cm. alta, pilis patentibus induta. *Stipulæ* foliaceæ, falcato-lanceolatæ. *Folia* glauco-viridia trifoliolata, foliolis lineari-oblongis vel lineari-lanceolatis 20–50 mm. longis 4–6 mm. latis, petiolo communi 20–33 mm. longo suffulta. *Flores* majusculi, in racemos paucifloros dispositi. *Bracteæ* parvæ, lineares ad basin pedicelli positæ. *Bracteolæ* angustæ,

caducæ. *Calyx* totus ± 9 mm. longus, laciniæ acutæ. *Vexillum* carinæ æquilongum. *Alæ* oblongæ. *Carina* 14–16 mm. longa, apice in rostrum attenuata. *Legumen* oviforme vel oblongum, glabrum, stipite ± 3 mm. longo instructum.

AMBOLAND: Ondonga, *Rautanen* No. 373! Olukonda, *Rautanen* No. 374! *Schinz* No. 2062! Hb. Turic.

An ally of *C. podocarpa*, DC., with rather narrow, glaucous-green, linear-oblong or linear-lanceolate leaflets, and yellow or bluish flowers in few-flowered racemes.

298. C. HIRSUTISSIMA, *Schinz in Bull. Herb. Boiss.* sér. II. iii. (1903) 819; *Schinz in Viertelj. Nat. Ges. Zürich*, lii. (1907) 421.

Suffrutex ramosus, hirsutissimus. *Stipulæ* lanceolatæ vel falcato-lanceolatæ. *Folia* trifoliolata, foliolis oblanceolatis vel oblongo-oblanceolatis 10–20 mm. longis 3–4 mm. latis, petiolo communi hirto 10–20 mm. longo suffulta. *Flores* lutei, in racemos laxos paucifloros dispositi. *Bracteæ* parvæ. *Calyx* totus circ. 9–10 mm. longus; laciniæ acuminatæ. *Vexillum* circ. 15 mm. longum. *Alæ* oblongæ, carina breviores. *Carina* dorso rectangulari-curvata, apice in rostrum attenuata, 14–15 mm. longo. *Legumen* glabrum, oblongum, cum stipite 25–30 mm. longum; stipes 4–5 mm. longus.

HEREROLAND: Otavi, *Dinter* No. 663! Hb. Turic. In flower and fruit 17 October, 1899.

299. C. MARLOTHII, *Engl. in Jahrb.* x. (1888) 27.

Herba 2–3 dm. alta, sparse longe pilosa, a medio ramosa. *Stipulæ* lineari-lanceolatæ. *Folia* trifoliolata, foliolis breviter petiolulatis oblongo-lanceolatis utrinque acutis lateralibus, 20–25 mm. longis 6–7 mm. latis, petiolus circ. 20 mm. longus. *Flores* in racemos pluri- vel multifloros dispositi. *Racemi* apice densiflori. *Calycis laciniæ* 4–5 mm. longæ, tubo subduplo longiores. *Corolla* circ. 15 mm. longa. *Carina* dorso genuflexa. *Legumen* ± 17 mm. longum, oblongum, glabrum, stipite circ. 4–5 mm. longo instructum.

HEREROLAND: River Swachaub, *Marloth* No. 1851! Hb. Berol.

300. C. DAMARENSIS, *Engl. in Jahrb.* x. (1888) 27.

C. Lindeni, Schinz in Bull. Herb. Boiss. sér. II. iii. (1903) 819.

C. Lindneri, Schinz in Viertelj. Nat. Ges. Zürich, lii. (1907) 422.

Erecta, ramosa, 15–25 cm. alta, ubique cinereo-pilosa. *Stipulæ* lineari-lanceolatæ, interdum caducæ. *Folia* trifoliolata, foliolis lineari-oblongis obtusis mucronulatis lateralibus 15–20 mm. longis 4–5 mm. latis, intermediis longioribus, petiolo communi 10–25 mm. longo suffulta. *Flores* mediocres, in racemos 3–5-floros dispositi. *Pedicelli* breves. *Bracteæ* parvæ, angustæ. *Calycis tubus* cupuliformis, 3 mm. longus; laciniæ lanceolatæ, tubum

æquantes. *Vexillum* calyce duplo longius. *Alæ* oblongæ, carinæ fere æquilongæ. *Carina* dorso genuflexa, circ. 10–12 mm. longa. *Legumen* oblongum, obtusum, 20–25 mm. longum, polyspermum, stipes 3–4 mm. longus.

HEREROLAND: Karribib, *Marloth* No. 1310! Hb. Berol.; Otjimbinque, *Lindner*! Hb. Turic.; Spitzkoppjes, *Dinter* No. 37! Hb. Turic.

GREAT NAMAQUALAND: Gamoxab, *Schinz*, No. 2060! Hb. Turic.

Series 78. Flores mediocres, in racemos laxiuscule 3–6–12-floros dispositi. Carina dorso curvata, circ. 11–12 mm. longa, apice breviter rostrata. Stipulæ semilunatæ, foliaceæ, persistentes. Legumina stipitata, glabra. Suffrutex erectus.

301. C. NATALITIA, *Meissn. in Hook. Lond. Journ. Bot.* ii. (1843) 67; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 46; *Baker in Oliver, Fl. Trop. Afr.* ii. 34; *Hiern, Cat. Welw. Afr. Pl.* i. 203.

C. kilimandscharica, Taubert in Engl. Hochgebirgsflora, 246 (1895).

Fruticosa vel suffruticosa, 1–2 m. alt. *Rami* angulares, pubescentes. *Folia* trifoliolata, foliolis cuneato-oblongis vel oblongo-obovatis obtusis vel mucronulatis, intermedio paullo longiore sæpius 15–25 mm. longis 3–8 mm. latis, petiolo communi 8–16 mm. longo prædita. *Racemi* terminales. *Flores* glabri lutei, circ. 12 mm. longi. *Calyx* subglaber, ±8 mm. longis. *Vexillum* subrotundum, basi bicallosum calycem superans. *Alæ* carinæ subæquilongæ. *Carina* dorso rotundata vel subrotundata. *Legumen* polyspermum, subcylindricum, cum stipite 30–34 mm. longum.

S. ABYSSINIA: Harrar, *Ellenbeck* No. 888! Hb. Berol.; *Robecchi Brichetti* No. 290! Hb. Turic.

SOMALILAND: Sheik Mahomet, *Donaldson Smith* No. 248! Hb. Mus. Brit.

UGANDA: Mt. Ruwenzori, *Scott Elliot* No. 7781! Uganda, *Rev. C. Wilson*! Hb.

GERMAN EAST AFRICA: Kilimanjaro, *Meyer* No. 299! Hb. Berol.; Marungu, *Volkens* No. 1428! East Uluguru, *Stuhlmann* No. 9055! Hb. Berol.; Uhehe, *Hauptmann* Prince! Hb. Berol.; Amani, *Braun* No. 1485! 1845! Usumbura, *Keil* No. 195! Hb. Berol.

NYASALAND: *Buchanan* (1891) No. 598! Mt. Chiradzulu, *Whyte*! Hb. Kew.; Mt. Zomba, *Whyte*! Hb. Kew.; Mt. Milanji, *Whyte*! Hb. Mus. Brit.

RHODESIA: Victoria, *C. F. Monro* No. 1779! Hb. Mus. Brit.

GAZALAND: *Swynnerton* Nos. 365! 478! Hb. Mus. Brit.

ANGOLA: Pungo Andongo, *Welwitsch* No. 1970! Hb. Mus. Brit.

SOUTH AFRICA: Near River Umlass, Port Natal, *Krauss* No. 339! Hb. Mus. Brit. and various other collectors in Natal; District of George, *Bowie*! Hb. Mus. Brit.

C. gymnocalyx, Baker, is perhaps only a depauperate form of this species.

Var. nov. SENGENSIS, *Bak. fil.*

Caulis elongatus, basi suffruticosus. *Folia* trifoliolata, foliolis cuneato-oblanceolatis 8–20 mm. longis 3–5 mm. latis, subtus magis fusco-hirsutis, petiolo pubescente 5–9 mm. longo instructa. *Flores* paullo minores, in racemos laxos 2–8-floros dispositi. *Calyx* totus 6 mm. longus, dentibus 3–5 mm. longis acutis, extus fusco-pubescens. *Pedicelli* fusco-pubescentes. *Carina* naviculariformis, cum unguibus 15–16 mm. longa, margine interiore lanata.

CONGO REGION; Mt. Senga mountain slope, *Kässner* No. 2904! Hb. Turic.

Differs from the type in the fuscous pubescent calyx, and pedicels, and in the leaves being much more hairy below. The flowers are slightly smaller.

Series 79. Flores mediocres, in racemos paucifloros dispositi. Carina dorso rotundata, 10–14 mm. longa. Stipulæ sæpissime foliaceæ, brevissime petiolatæ. Legumen oblanceolatum, usque ad 33 mm. longum, breviter stipitatum.

302. C. GOETZEI, *Harms in Engl. Jahrb.* xxviii. (1900) 399.

Frutex ramosus, 3–4 m. altus, ramis pubescentibus vel villosulis. *Folia* trifoliolata, foliolis oblongo-obovatis obovatis vel oblongo-lanceolatis apice rotundatis vel emarginulatis, 2–5·5 cm. longis 12–25 mm. latis, petiolo communi 1–3 cm. longo suffulta. *Racemi* pauciflori, terminales. *Bracteæ* lineares. *Calyx* pubescens, ultra medium 5-dentatus, dentibus lanceolatis. *Corolla* calycem paulo superans. *Vexillum* extus apicem versus pilosum. *Carina* 10–14 mm. longa. *Legumen* villosum.

GERMAN EAST AFRICA: Uhehe, Matanana Plateau, *Goetze* No. 735! Hb. Berol.

Series 80. Flores mediocres, in racemos laxos dispositi. Carina dorso rotundata, circ. 13 mm. longa. Stipulæ magnæ, conspicuæ. Legumen obovatum, brevissime stipitatum.

303. C. CORDATA, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 27 (1871); *Hiern, Cat. Welw. Afr. Pl.* 200.

Suffrutex usque ad 1·3 m. alt., ramosus. *Rami* divaricati. *Stipulæ* usque ad 25–30 mm. longæ. *Folia* trifoliolata, foliolis ellipticis 30–50 mm. longis 15–20 mm. latis, subtus rufescenti-sericeo-tomentosis, petiolo communi 15–35 mm. longo suffulta. *Bracteæ* parvæ, angustæ, persistentes. *Bracteolæ* parvæ, circ. medium pedicelli positæ. *Calyx* totus 12–14 mm. longus; laciniæ lanceolatæ. *Vexilli* lamina 13–14 mm. longa, ungue circ. 2 mm. longo. *Carina* uncinata, circ. 13 mm. longa. *Legumen* ferrugineo-hirsutum, usque ad 35 mm. longum et 18 mm. latum.

Angola: Huilla, *Welwitsch* Nos. 1917! 1918! Hb. Mus. Brit.; Between Cubango and Cunene, *Gossweiler* No. 2869! Between Kubangue and Kului, *Gossweiler* No. 2946! Hb. Mus. Brit.

Noticeable on account of the large stipules.

Series 81. Flores mediocres, in racemos 3–10-floros laxos dispositi. Carina dorso rotundata, 11–12 mm. longa. Stipulæ ovatæ inter majores generis. Ovarium stipitatum.

304. C. xanthoclada, *Bojer*, var. nov. Stolzii, *Bak. fil.* (Pl. **14 B.**)

Caulis glaber, subteres vel superne tenuiter angulatus, ramosus, 1–2 m. alt. *Stipulæ* basi inæquilateraliter cordatæ, 15–20 mm. longæ 8–10 mm. latæ, petiolulatæ. *Folia* petiolata, trifoliolata, foliolis oblanceolatis apice mucronatis 10–17 mm. longis 3–5 mm. latis, subtus conspicue reticulatis. *Calyx* ±7 mm. longus, dentibus 4 mm. longis. *Vexillum* in sicco flavum. *Alæ* cum ungue 12 mm. longæ, 5–6 mm. latæ. *Carina* unguiculata, apice acuta, vix rostrata, falcata.

Kondeland: Alt. 1450 metr., *Stolz* No. 65! Hbb. Berol., Turic. In flower, 2 July, 1899.

C. xanthoclada, Bojer, comes from Madagascar.

Series 82. Flores in capitula conferta circ. 5–10-flora dispositi, capitulis longe pedunculatis. Carina purpurea, 11–14 mm. longa. Stipulæ semilunatæ. Ovarium sessile, sericeum, multiovulatum.

305. C. decumbens, *Welw. ex Baker in Oliver, Fl. Trop. Afr.* ii. 33 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 202.

Perennis, decumbens. *Caules* pilis brunneis patentibus induti. *Stipulæ* 6–8 mm. longæ. *Folia* trifoliolata, foliolis oblanceolatis, intermediis 20–40 mm. longis, apice subacutis pilis brevibus conspersus, petiolo communi 6–12 mm. longo prædita. *Flores* flavi. *Pedicelli* 3–4 mm. longi. *Calyx* totus circ. 6 mm. longus, dentibus lanceolatis tubum æquantibus. *Corolla* calyce duplo longior. *Legumen* breve, pilis rufescentibus vestitum.

Angola: Huilla, *Welwitsch* No. 1909! Pungo Andongo, *Welwitsch* No. 1910! Hb. Mus. Brit.; Kakonda, *Gossweiler* No. 4268! Hb. Mus. Brit.

Series 83. Flores pauci. Pedunculi laterales vel terminales, sæpius 1- vel 2-flori. Stipulæ lanceolatæ. Legumina oblonga, sessilia, glabra.

306. C. ervoides, *Welw. ex Baker in Oliver, l. c.* ii. 19 (1871); *Hiern, Cat. Welw. Afr. Pl.* i. 198.

Suffrutex glaber. *Caules* plures, ex eadem radice orti, diffusi, decumbentes vel ramis adscendentibus. *Stipulæ* rigidæ, 6–12 mm. longæ. *Folia* trifoliolata, foliolis linearibus, intermediis 16–24 mm. longis 2–4 mm. latis,

conspicue venosis, petiolo communi 6–12 mm. longo prædita. *Calyx* glaber, 7–8 mm. longus, dentibus superioribus lanceolatis inferioribus linearibus. *Corolla* pallide lutea. *Legumina* 24–30 mm. longa, 6–8-sperma.

ANGOLA: Huilla, *Welwitsch* No. 1984! Hb. Mus. Brit.

Flowers pale yellow with a tinge of violet.

Series 84. Flores parviusculi vel mediocres, in racemos pauci- vel plurifloros dispositi. Carina dorso genuflexa, sæpissime 6–10 mm. longa, marginibus lanatis. Stipulæ foliaceæ, falcatæ. Legumina oblonga vel oblongo-cylindrica, sessilia vel subsessilia. Herbæ vel suffrutices, pubescentes vel puberuli.

307. C. GOREENSIS, *Guill. & Perr. Fl. Seneg.* i. 165 (1830–33); *Benth. in Hook. Lond. Journ. Bot.* ii. 589; *Baker in Oliver, Fl. Trop. Afr.* ii. 29.

C. falcata, Schum. et Thonn. Pl. Guin. 335, *non* Vahl.

Suffrutex diffusus, e basi ramosus, puberulus. *Stipulæ* magnæ. *Folia* trifoliolata, foliolis cuneato-oblongis sæpius emarginatis in specimine typico 15–20 mm. longis 5–9 mm. latis, utrinque subglabris viridibus, petiolo communi 7–30 mm. longo prædita. *Flores* flavi, mediocres, in racemos paucifloros dispositi. *Bracteolæ* non conspicuæ. *Bracteæ* angustæ, caducæ. *Calyx* profunde 5-partitus; laciniæ lanceolatæ, fere æquales. *Vexillum* ovale, 4–6 mm. longum, flavescens, utrinque glabrum. *Alæ* oblongæ, subfalcatæ. *Carina* rostriformis, naviculariformis, 8–9 mm. longa. *Legumen* oblongo-cylindricum, sessile, 8–18 mm. longum, puberulum, 10–12-spermum.

SENEGAMBIA: In the island of Gorée, and near Kounoum in the Cape Verd Peninsula, and at Albreda, *Perrottet* No. 170! Hb. Mus. Brit., etc.

SIERRA LEONE: Scarcies, *Scott Elliot* No. 4393! Hb. Mus. Brit.; Samu Country, *Scott Elliot* No. 4216! Hb. Kew.

GOLD COAST: Accra, *Don*! *Thonning*! *Vogel*! Hb. Kew.

TOGOLAND: Near Lome, *Warnecke* No. 25! Hbb. Berol., Mus. Brit.

DAHOMEY: *Le Testu*! Hb. Mus. Paris.

CONGO REGION: Bukama, *J. Bequaert* No. 114! Hb. Brux.

RHODESIA: Near Mumbwa, *Mrs. Macaulay* No. 323! p. p. Hb. Kew.

Var. ANGUSTIFOLIA, *Baker, l. c.* ii. 29.

Foliola linearia, 4–6 mm. lata. *Flores* lutei.

SIERRA LEONE: *Afzelius*! *Smeathmann*! Hb. Mus. Brit.

NIGERIA: Banks of the Niger, *Barter*! Hb. Kew.

FERNANDO PO: *Mann*! Hb. Kew.

Subsp. C. MACROSTIPULA, *Steud. in Pl. Schimp. Abyss.* Sect. II. No. 708, pro sp.; *A. Rich. Tent. Fl. Abyss.* i. 153 (1847).

Annua vel interdum basi sublignosa et fere suffrutex. *Caulis* virgatus,

erectus, striatus. *Folia* trifoliolata, foliolis oblongis vel oblongo-ellipticis in specimine typico 3–4 cm. longis, 10–15 mm. latis petiolo communi 25–30 mm. longo prædita. *Legumen* sessile, 15–20-spermum.

Cameroons : *Ledermann* No. 3561 ! Hb. Berol.

Abyssinia : *Quartin-Dillon*, Hb. Mus. Paris ; near River Tacaze, *Schimper* No. 708 ! Hb. Mus. Brit., etc. ; Hamede, *Schimper* No. 439 ! (1862) Hb. Mus. Brit.

Angola : Golungo Alto, *Welwitsch* Nos. 1962 ! 1963 ! ; Golungo Alto, *Welwitsch* No. 1964 ! (forma caulibus prostrato-adscendentibus) Hb. Mus. Brit.

308. C. cylindrocarpa, *DC. Prod.* ii. 133 (1825) ; *Guill. & Perr. Fl. Seneg.* i. 164 ; *Baker in Oliver, Fl. Trop. Afr.* ii. 40.

C. paniculata, Perr. in litt. *non* Willd.

Radix crassa. *Caulis* herbaceus, basi suffruticosus, 4–6 dm. altus, e basi ramosus, striatus. *Stipulæ* acutæ. *Folia* trifoliolata, foliolis elliptico-oblongis 3–6 cm. longis 10–11 mm. latis pallide viridibus subtus vix pubescentibus, petiolo communi patente vel deflexo 12–32 mm. longo prædita. *Flores* mediocres, in racemos plurifloros dispositi, flavi. *Bracteolæ* basi calycis lineares, tubo breviores. *Bracteæ* caducæ. *Vexillum* flavum, lineis roseis longitudinaliter striatum, apice violaceum, ±7 mm. longum. *Alæ* flavescentes, oblongæ, unguiculatæ. *Carina* pallide flavescens, apice in rostrum attenuata, 8–12 mm. longa. *Legumen* cylindricum, 25–30 mm. longum, sessile, breviter pubescens vel demum fere glabrum, 24–30-spermum.

Senegambia : In the Walo region near Kourna, Richard Toll, *Perrottet* ! Hb. Mus. Brit., etc. ; Senegal, *Leprieur* ! Hb. Mus. Paris.

Gambia : *J. Brown-Lester*, No. 18 ! Hb. Kew.

Guinea : Banks of the Gaboon, *Duparquet*.

Congo Region : Katanga, Elisabethville, *Homblé* No. 289 ! Hb. Brux.

Rhodesia : Near Mumbwa, *Mrs. Macaulay* No. 608 ! Hb. Kew.

Series 85. Flores axillares vel laterales, solitarii vel gemini, 8–9 mm. longi. Stipulæ foliaceæ, integerrimæ. Legumen subcompressum, ovale. Suffrutex foliis subsessilibus.

309. C. erisemoides, *Ficalho & Hiern in Trans. Linn. Soc., Bot.* Ser. ii. ii. (1881) 17.

Suffrutex dense ramosus, inermis, pilis albidis vestitus, ut videtur nanus. *Foliola* ciliata, supra glabra, infra villosa, integerrima, subsessilia obovato-elliptica, lateralia 1·25 cm. longa centrali leviter majore. *Flores* pedunculati, cernui. *Calyx* profunde fissus, extus hirtus, corollam circiter æquans, lobis lanceolatis acutis inter se subæqualibus. *Ovarium* compressum, villosum.

Legumen circ. 14–18-spermum.—Speciem non vidi quamobrem descriptio secundum Ficalho & Hiern.

ANGOLA: Upper course of the River Ninda, an affluent of the Zambesi, *Serpa Pinto* No. 3, Hb. Olyssipo.

SPECIES NON SATIS NOTÆ.

C. ACUMINATA, *DC. Prod.* ii. 128 (1825).

Stipulæ ovato-lanceolatæ, petiolo breviores, acuminatæ. *Folia* petiolata, linearia, mucronato-acuminata, subtus ramulis calycibusque adpresse sericeo-pubescentibus. *Pedunculi* oppositifolii, 1–2-flori. *Ovarium* glabrum. *Flores* quam in priore (*C. virgultalis*, Burch.) minores.

Cap. B. Spei, *Burchell* No. 2327.

I regret I have been unable to find this number of Burchell's in Herb. Kew.

C. ELONGATA, *Thunb. Fl. Cap.* (1823) 571; *Harvey in Harvey & Sonder, Fl. Cap.* ii. 45.

Caulis suffrutescens, erectus, ramosus, totus tectus tomento argenteo nitido. *Rami* teretes, simplices, elongati, erecti. *Folia* ternata, alterna, petiolata. *Foliola* ovata, obtusa, argentea, integra, subsessilia æqualia, unguicularia. *Petioli* longitudine folioli patentes. *Flores* in apice ramorum spicati. *Spica* digitalis usque spithamea, floribus et leguminibus reflexis. *Corollæ* luteæ, glabræ. *Legumina* ovata, acuta, vix unguicularia.

SOUTH AFRICA; Karroo, near Bockeveld, *Thunberg.*

Harvey describes this plant as densely velvety tomentose, having densely woolly one-seeded pods, about 6 mm. long.

SPECIES CROTALARIÆ EXCLUDENDÆ VEL OMNINO DUBIÆ.

amplexicaulis, Linn. = Rafnia amplexicaulis, *Thunb.*
angustifolia, Jacq. = Lebeckia sericea, *Thunb.*
argentea, Jacq. = Argyrolobium petiolare, *Walp.*
azurea, Eckl. & Zeyh. = Lotononis azurea, *Benth.*
bracteolata, Perr. = Indigofera bracteolata, *DC.*
cordifolia, Linn. = Hypocalyptus obcordatus, *Thunb.*
cuneiformis, Lam. = Rafnia cuneifolia, *Thunb.*
diversifolia, E. Mey. = Lotononis laxa, *Eckl. & Zeyh.*
dubia, Balf. fil. non R. Grah. = *Crotalaria leptocarpa,* Balf. fil.
floribunda, Lodd. = Viborgia obcordata, *Thunb.*
genistoides. Lam. = Priestleya sp.
imbricata, Linn. = Amphithalea densa, *Eckl. & Zeyh.*
involucrata, E. Mey. = Lotononis involucrata, *Benth.*
lanata, Thunb. = Priestleya villosa, *DC.*

lenticula, E. Mey. = Lotononis lenticula, *Benth.*
leptocarpa, Balf. fil. (Quid?) ; cf. *C. dubia*, Balf. fil.
lineata, Thunb. (Quid ?).
lunaris, Linn. = Argyrolobium lanceolatum, *Eckl. & Zeyh.*
minor, C. H. Wright = Lotus sp.
obcordata, Berg. = Vibórgia obcordata, *Thunb.*
opposita, Linn. = Rafnia opposita, *Thunb.*
orbicularis, E. Mey. = Podalyria orbicularis, *E. Mey.*
oxyptera, E. Mey. = Lotononis oxyptera, *Benth.* var. *b.*
parvifolia, Thunb. = Cœlidium Thunbergii, *Harv.*
perfoliata, Linn. = Baptisia perfoliata, *R. Br.*
perforata, Linn. = Borbonia ciliata, *Willd.*
perplexa, E. Mey. = Lotononis perplexa, *Eckl. & Zeyh.*
procumbens, Chr. Smith = *Crotalaria Tuckeyana*, Steud.
pulchella, Andrews = Lebeckia cytisoides, *Thunb.*
quinata, E. Mey. = Lotononis acutiflora, *Benth.*
reflexa, Thunb. = Priestleya sericea, *E. Mey.*
serpens, E. Mey. = Euchlora serpens, *Eckl. & Zeyh.*
trichopoda, E. Mey. = Lotononis trichopoda, *Benth.*
triflora, Linn. = Rafnia triflora, *Thunb.*
truncata, E. Mey. = Lotononis umbellata, *Benth.*
Tuckeyana, *Steud.*, nomen nudum ; cf. *C. procumbens*, Chr. Sm.
versicolor, E. Mey. = Lotononis versicolor, *Benth.*
vexillata, E. Mey. = Lotononis prostrata, *Benth.*
virgata, Herb. Holm. = Rafnia Thunbergii, *Harv.*

EXPLANATION OF THE PLATES.

PLATE 9. Sect. **Simplicifoliæ.**

1. *C. minutissima*, Bak. fil., nat. size. 2. Leaf, ×2. 3. Flower, ×6. 4. Standard, ×6. 5. Wing, ×6. 6. Carina, ×6. 7. Ovary and style, ×6. 8. Pod, ×2.

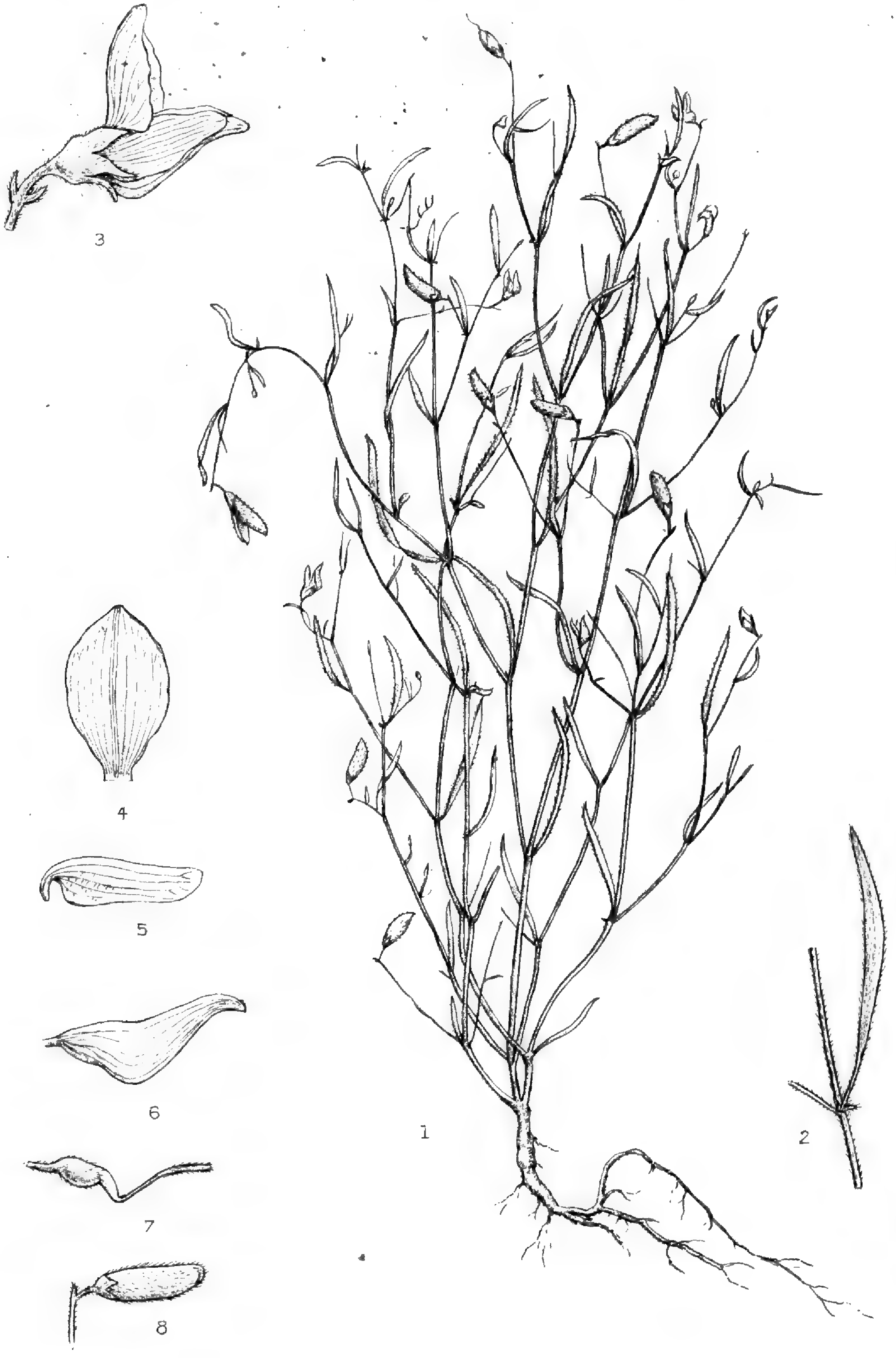
PLATE 10. Sect. **Sphærocarpæ.**

1. Portion of plant of *C. Elisabethæ*, Bak. fil., nat. size. 2. Leaf, × 2. 3. Flower, × 3. 4. Standard, × 3. 5. Wing, × 3. 6. Carina, × 3. 7. Ovary and style, × 3. 8. Pod, ×3.

PLATE 11. Sect. **Chrysocalycinæ.**

A. *C. atrorubens*, Hochst.

1. Flowering branch, nat. size. 2. Flower, ×3. 3. Bracteoles, ×3. 4. Standard, ×3. 5. Wing, ×3. 6. Carina, ×3. 7. Ovary and style, ×3. 8. Pod, ×3.



R. M. Cardew, del
P. Highley, lith.
Hodges & Son, imp.

CROTALARIA (§ SIMPLICIFOLIAE) MINUTISSIMA. *Bak. fil.*

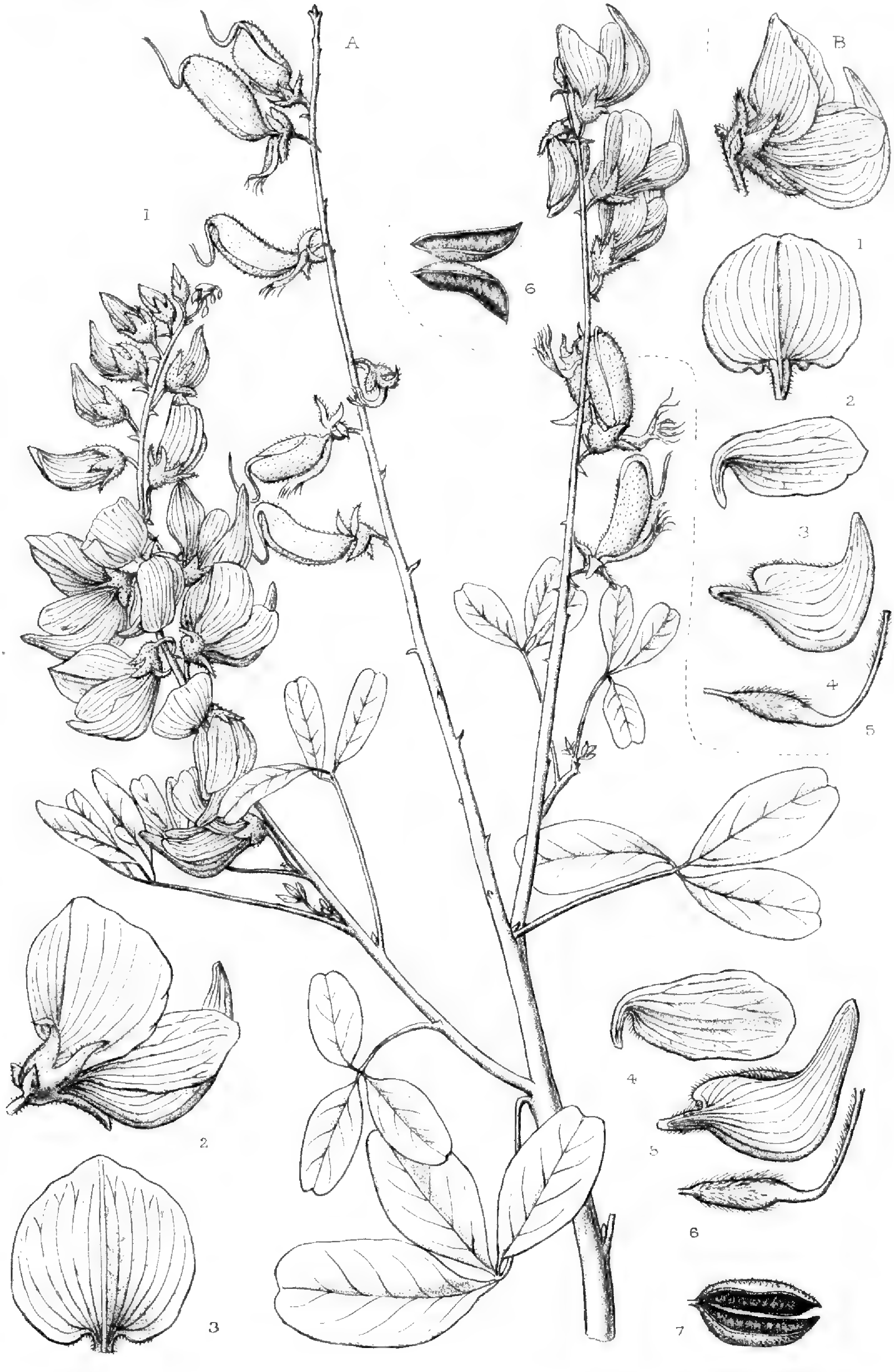
R. M. Carde[illegible] del.
P. Highley lith.

Hodges & Son imp.

CROTALARIA (§ SPHAEROCARPAE) ELISABETHAE. *Bak. fil.*

R. M Cardew, del.
P. Highley, lith.
Hodges & Son. imp.

A. CROTALARIA (§ CHRYSOCALYCINAE) ATRORUBENS, *Hochst.*
B. CROTALARIA (§ CHRYSOCALYCINAE) PERROTTETII, *D.C.*



R. M. Cardew. del.
P. Highley. lith.

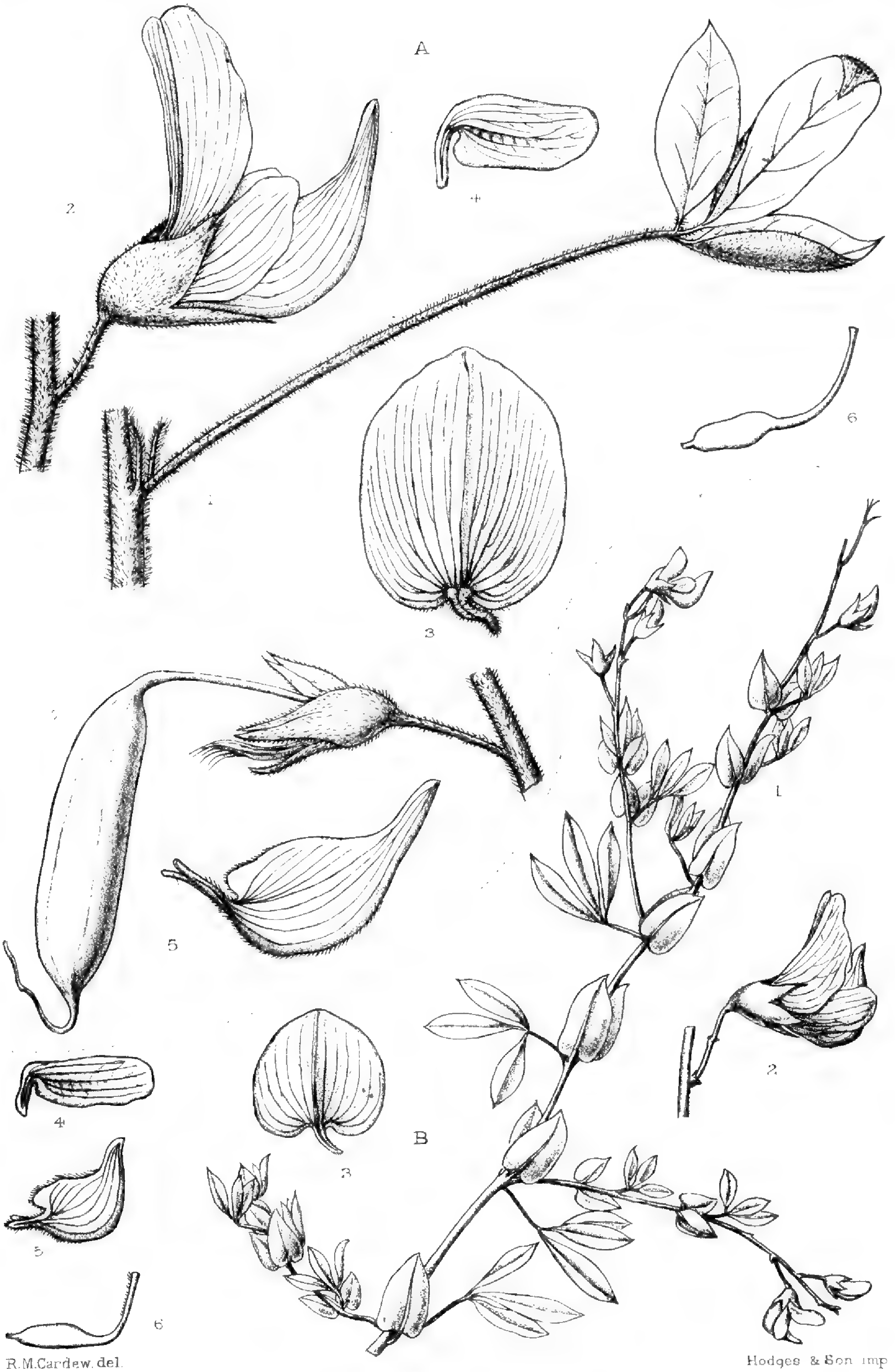
Hodges & Son. imp.

A. CROTALARIA (§ FARCTAE) LEUCOCLADA, *Baker.*
B. CROTALARIA (§ FARCTAE) LUPINOIDES, *Hochst.*

R. M. Cardew del.
P. Highley lith.

Hodges & Son, imp.

A. CROTALARIA (§ SPINOSAE) GRIQUENSIS, *Bolus*
B. CROTALARIA (§ SPINOSAE) SPINOSA, *Hochst.*



R. M. Cardew, del.
P. Highley lith.
Hodges & Son imp.

A. CROTALARIA (§ EUCROTALARIA) IMPERIALIS, *Taubert.*
B. C. (§ EUCROTALARIA) XANTHOCLADA, *Bojer*
var. STOLZII, *Bak. fil.*

B. *C. Perrottetii*, DC. (Chrysocalyx Perrottetii, *Guill. & Perr.*)

1. Flowering branch, nat. size. 2. Flower, ×3. 3. Standard, ×3. 4. Wing, ×3. 5. Carina, ×3. 6. Young pod with style attached, ×3.

Plate 12. Sect. **Farctæ.**

A. *C. leucoclada*, Baker.

1. Flower, ×2. 2. Standard, ×2. 3. Wing, ×2. 4. Carina, ×2. 5. Ovary and style, ×2. 6. Pod, nat. size.

B. Flower of *C. Saltiana*, Andrews. (C. lupinoides, *Hochst.*)

1. Flower, ×2. 2. Standard, ×2. 3. Wing, ×2. 4. Carina, ×2. 5. Ovary and style, ×2. 6. Pod, nat. size.

Plate 13. Sect. **Spinosæ.**

A. *C. griquensis*, Bolus.

1. Part of plant, nat. size. 2. Flower, ×3. 3. Standard, ×3. 4. Wing, ×3. 5. Carina, ×3. 6. Ovary and style, ×3. 7. Pod, ×3.

B. *C. spinosa*, Hochst.

1. Part of plant, nat. size. 2. Flower, ×3. 3. Standard, ×3. 4. Wing, ×3. 5. Carina, ×3. 6. Ovary and style, ×3. 7. Pod, ×3.

Plate 14. Sect. **Eucrotalaria.**

Subsect. Grandifloræ.

A. *C. imperialis*, Taubert.

1. Leaf and stipules, nat. size. 2. Flower, nat. size. 3. Standard, nat. size. 4. Wing, nat. size. 5. Carina, nat. size. 6. Ovary, nat. size. 7. Stipitate pod, nat. size.

Subsect. Stipulosæ.

B. *C. xanthoclada*, Bojer, var. *Stolzii*, Bak. fil.

1. Part of plant, nat. size. 2. Flower, ×2. 3. Standard, ×2. 4. Wing, ×2. 5. Carina, ×2. 6. Ovary, ×2.

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Results obtained by crossing a Wild Pea from Palestine with Commercial Types. By Arthur W. Sutton, F.L.S., V.M.H.

(Plates 15–17 and 1 Text-figure.)

[Read 6th February, 1913.]

It has fallen to my lot for very many years past to make a comparative study of all the leading kinds of vegetables grown either in England and on the Continent of Europe, or in America, and in doing so, it has been only natural to try to discover the wild forms from which the present highly developed types have originated. But though in some cases these wild forms, and the stages in their development, may be fairly well known, yet in many others it is not so, and we have to admit that the original wild form is either unknown, or, if known, that we are without any authentic record of the steps which have been taken, and the successive stages reached, in the long process of development. For instance, it is constantly said that the wild *Brassica oleracea* is the original form from which all our garden and farm varieties of Cabbage, Brussels Sprouts, Cauliflower, Savoy, Kale, etc., are descended, but practically all records of the upward stages of development have been lost, and also the names of those by whom this task of development was effected. The Field and Garden Peas are also cases in point. The former—the Field Pea—is well-known as *Pisum arvense*; its flowers are always bicoloured, purple and white, and the seeds have grey or brown seed-coats, and are sometimes spotted. The latter—the Garden Pea—is equally well known as *Pisum sativum*; the flowers are always white and the seed-coats white, yellow, or green, and in form the seeds are either "round" or "wrinkled."

The Field Peas are never eaten as "green peas," but are only grown for "corn," *i. e.*, their seeds are used in the dry state for feeding purposes, and the taste, when green or unripe, is always bitter.

The Garden Peas are generally used as "green peas," *i. e.* when unripe, although a large quantity are also grown for boiling when ripe, and for producing pea-flour for culinary purposes.

Of the *Pisum arvense*—or Field Pea—many herbarium specimens exist, collected in different parts of the world, but there is no variety in cultivation which has in recent years been raised from any wild form, nor is there any authentic record of the labours of those who presumably spent many years in obtaining the intermediate forms from which the varieties of to-day have originated.

The same is true of the Garden Peas of to-day, with this exception, that whereas many specimens of the wild *Pisum arvense* have been collected, it is

not possible to-day, so far as I am aware, to find in any locality a plant of *Pisum sativum* in its wild state. The two species, *Pisum arvense* and *Pisum sativum*, are so different in character, that we naturally assume a distinct origin for each, although some authorities claim a common ancestor for both. Under these circumstances it was with very special interest that I noticed in 1904, in a remote part of Palestine, some small Pea plants which were growing in an absolutely wild state, and where there was no possibility of their being "escapes" from previous cultivation.

This wild Pea was in full pod and had lost its blooms, so that I was unable to see whether it was most likely to be a variety of "*Pisum sativum*" or "*Pisum arvense*"; but as the form of the pods, though exceedingly small, so

Fig. 1.

The Palestine Pea.

much resembled those of the Garden Pea, I clung to the hope that I had found an original form of that Pea, rather than of the Field Pea, especially as there was no colour in the axils, a character which is invariably seen in every commercial type of "*Pisum arvense*" I have met with, and is always associated with coloured flowers.

The height of the plant, as I saw it growing in Palestine, was perhaps two feet or a little less, the growth was by no means robust, and the pods were very small, slightly curved and obtuse.

The most interesting feature, however, was that the stipules and leaflets, the latter being very small, were deeply serrated (see fig. 1), a character so far found, as I am aware, in no other form of either "*Pisum sativum*" or "*Pisum arvense*," although in some types of Peas there is a slight serration in the stipules.

I was able to bring home several plants and pods of the wild Pea from Palestine, and since 1904 I have grown a pure stock from the seeds which ripened, and have also made a great number of crosses with various types of culinary Peas.

After bringing home the original plants, I removed the seeds from the pods, and was surprised to find that instead of being white, yellow, or green as I had hoped, the seed-coats varied from olive-green, mottled with brown, to a dark colour (Pl. **17.** fig. 9), thus proving that my plant was certainly not *Pisum sativum*, but presumably a form of *Pisum arvense*.

The seeds were duly sown in my greenhouse, and I allowed the plants to mature under glass. The "habit" of the plants was much as I had seen it in Palestine; the stems were very slender, but when the flowers opened I found they were *self-coloured* of a shade much resembling magenta (Pl. **15.** fig. 2 D), and quite different from the blooms of any Peas I had previously grown, thus confirming my conclusion that I was not dealing with a form of "*Pisum sativum*," but more likely with a form of "*Pisum arvense*," even though all cultivated varieties of "*Pisum arvense*" invariably have *bi-coloured* and not *self-coloured* flowers, as in this instance. Besides this, although the flowers of the Palestine Pea were coloured, there was *no colour whatever* in the axils of the leaves or stems of the plant, which, as I have already mentioned, is characteristic of varieties of "*Pisum arvense*." Another striking character was that the pods of the Palestine Pea were lined inside with a white woolly substance similar to that found in the pods of Broad Beans, but never seen, so far as I am aware, in any other variety of *Pisum* *.

* I may here say that Dr. Stapf has very kindly investigated the question of the identity of the Palestine Pea for me, and examined the various herbarium specimens of *Pisum* at Kew, and is of the opinion that although the Pea I found in Palestine somewhat resembles in general characteristics "*Pisum humile*" described by Boissier in the 'Flora Orientalis,' p. 623, from the Huleh Plain of Palestine, it appears to differ chiefly in the colour of the blooms, which in "*Pisum humile*" are said to be "standards dirty lilac" and "wings dirty purple," whilst those of the Pea I found are, as already mentioned, self-coloured and magenta. The seed of "*Pisum humile*" also is described as being slightly rough, whilst those of the one in question are fairly smooth. As to whether "*Pisum humile*" lacks the colour in the axils, and has a woolliness in the pod, there appears to be no evidence to show.

Chief characters of the Palestine Pea.

Weak or slender habit of growth. (Pl. **15**. fig. 1 B.)
Self-coloured magenta blooms. (Pl. **15**. fig. 2 D.)
Serration of the stipules and leaflets. (Fig. 1, also Pl. **15**. fig. 3 F.)
Seeds, olive-green, mottled with brown, and no black hilum. (Pl. **17**. fig. 9.)
Pods produced singly or in pairs. (Pl. **15**. fig. 3 F.)
Absence of colour in the axils.
Woolliness in the interior of pod.
No fasciation in stems of plants.

I made 24 matings between this Palestine Pea and a corresponding number of forms of the white flowering "*Pisum sativum*," and 16 matings between the Palestine Pea and various forms of the coloured flowering "*Pisum arvense*." In some cases the Palestine Pea was used as the pollen parent, and in others as the seed-bearing parent.

36 out of the 40 matings either failed to germinate, or flowered but were sterile, or produced seeds in F_2, which then failed to germinate. 4 only did I find it possible to continue to F_3 or further, and of these 4 I propose to describe one only, as follows :—

(The reason I have chosen this cross is because it is the only instance in which one of the parental types was umbellate with fasciated stem, the parents thus affording greater contrast than could otherwise have been the case.)

PARENTAL FORMS.

Pisum sativum umbellatum. (Pl. **15**. fig. 1 A.)
(Crown-flowered or so-called Mummy Pea.)
The Palestine Pea. (Pl. **15**. fig. 1 B.)

Chief characters of *Pisum sativum umbellatum* :—

Strong habit of growth, about 6 feet in height. (Pl. **15**. fig. 1 A.)
White flowers produced in umbels terminally instead of axillary. (Pl. **15**. fig. 2 C.)
Pods produced in clusters. (Pl. **15**. fig. 3 E.)
White round seeds, no black hilum. (Pl. **17**. fig. 10.)
Absence of serration in the leaflets.
Absence of colour in the axils.
Stems of plants very much fasciated.

Between these two forms 6 crossings were made, using several plants of each parental form, but only one succeeded, and this gave one seed only.

The following is a brief history of the cross :—

F_1 Plants.

The cross gave one seed only. This was round, greenish in colour, and with no black hilum.

The hybrid plant grew about 2 feet in height, was of normal growth and not umbellate, the foliage was rather small with some leaflets serrated, the colour of the blooms was bi-coloured and not self-coloured (the standards being pink with wings dark purple). This plant produced five seeds, which were much like those of the parental Palestine seeds in colour, but varied in size.

No fasciation in stem.

F_2.

The five seeds were sown and all germinated, and grew sufficiently to show that they varied in character. Four of them, however, did not produce a single seed, and only one could be continued beyond F_2. The plant which matured was of fairly strong habit of growth, not umbellate, the leaflets had very little trace of serration, and the blooms were bi-coloured. No fasciation in stem. The seeds were small, brown mottled, with black hilum.

The seeds from this plant were sown the next year, the new types Nos. 1, 3, 4, and 5 appearing in F_3 and Nos. 2 and 6 in F_4.

New type No. 1. (Pl. **15**. fig. 4 G.)

A dark bi-coloured flowering form of the parental umbellate type, appearing in F_3. Previously, so far as I am aware, this dark-flowered umbellate form did not exist, the only umbellate forms hitherto known being (1) a white-flowered form (*Pisum arvense umbellatum*, Pl. **15**. fig. 4 H), and (2) a rose- and white-flowered form (*Pisum arvense umbellatum*, Pl. **15**. fig. 4 I).

The seeds of this new type (Pl. **17**. fig. 13) also differed from those of the parental umbellate form (Pl. **17**. fig. 10), and of the rose- and white-umbellate form (Pl. **17**. fig. 15). It will be noticed that the seeds of this new type are small and have a black hilum.

Apart from the colour of the blooms and the seed, the hybrid much resembles the parental umbellate form.

New type No. 2. (Pl. **16**. fig. 5.)

This is the nearest approach in general appearance I could find to an umbellate form of the Palestine Pea (although the flowers were white), and appeared in F_4 from New type No. 1. It was much weaker in growth than the parental umbellate form. The chief characters were as follows :—

Flowers white.

No serration in the leaflets.

No colour in axils.

Seeds smaller than the parental umbellate or crown-flowered Pea, but with a black hilum. (Pl. **17**. fig. 16.)

New type No. 3. (Pl. **16**. fig. 6.)

This plant is perhaps the most remarkable of all, being a *non-umbellate* form of a white flowering Pea, which resulted from a cross between the Palestine Pea (a coloured flowered, brown-seeded type) and the *Pisum sativum umbellatum* (white-flowered, white-seeded *umbellate* form). It appeared in F_3.

We have here, therefore, an instance of two types, so different from each other that they might be looked upon as specifically distinct, uniting to give a fertile hybrid. Crosses may, and probably have been made previously between types of the Garden Pea (*Pisum sativum*) and the Field Pea (*Pisum arvense*), but I may confidently say that there is no variety of Pea in commerce to-day, either amongst the Field Peas or culinary Peas, which has arisen in such a manner.

The chief characters were as follows :—

Fairly strong habit of growth.
Flowers white.
Non-umbellate.
Absence of serration in leaflets.
Absence of colour in axils.
Seeds yellow, with small black hilum. (Pl. **17**. fig. 17.)

New type No. 4. (Plant not illustrated.)

This plant somewhat resembled the last in growth, but differed in the colour of the bloom. It appeared in F_3. The chief characters were as follows :—

Non-umbellate.
Fairly strong habit of growth.
Flowers bi-coloured.
Absence of serration in leaflets.
Seeds, brownish in colour, mottled, with small black hilum. (Pl. **16**. fig. 18.)

New type No. 5. (Pl. **16**. fig. 7.)

This plant is really a more robust and stronger growing form of New type No. 4, and also appeared in F_3. The chief characters were as follows :—

Non-umbellate.
Strong habit of growth.
Flowers bi-coloured.
Absence of serration in leaflets.
Seeds much paler in colour than last named, and with a well-marked hilum. (Pl. **17**. fig. 19.)

New type No. 6. (Pl. **16**. fig. 8.)

This plant is practically identical in all characters with the parental umbellate type (Pl. **15**. fig. 2 C), except that the seeds (Pl. **17**. fig. 20) are

entirely distinct from those of the parental umbellate type (Pl. **17**. fig. 10), each seed of the New type No. 6 having a well defined black hilum which is entirely wanting in the parent. This appeared in F_4 and came from New type No. 5.

It will be seen by reference to the Plates that in F_3 the umbellate character reappeared in New type No. 1, but as mentioned, the blooms of this umbellate type were dark and bi-coloured, and not pink and white as in the only existing form of "*Pisum arvense umbellatum*" in cultivation. Fasciation in the stem reappeared.

None of the other plants were like the parental Palestine Pea, all being stronger in growth and without serration in the leaflets.

N.B.—It has been quite impossible to test any Mendelian ratios, owing to the marked sterility of the hybrids in the earlier stages.

General Notes on the Crosses.

I should like especially to note that the parental Palestine Pea has not reappeared in its true form with self-coloured flowers, neither has there appeared an exact counterpart of the Palestine Pea bearing white flowers, as might reasonably have been expected. I am inclined to think, however, that both may have been produced, and that if so they died off soon after germinating, being of too delicate habit to grow freely in the open ground. The parental white umbellate form, however, reappeared as before mentioned, but with seeds carrying a black hilum.

I have not yet found a magenta self-coloured umbellate type, nor an umbellate type with serrated leaflets, in fact these two characters, *i. e.*, magenta flowers and serrated leaflets, seem to have entirely disappeared.

I found that coloured flowers were dominant over white. Non-serration of the leaflets appeared in the one plant in F_2, and has continued.

The pods of the hybrids in F_1 were generally very small, sometimes smaller than those of the Palestine Pea itself, badly developed, and in most cases lined with a woolly substance inside, and the seedlings were generally sterile. Those which were fertile were only comparatively so, although in the plants which I have been able to keep growing the sterility has to a certain extent been overcome, and in these cases the woolliness in the pod has practically disappeared.

When the Palestine Pea was used as the pollen parent, the resulting seeds of the hybrids in F_1 were much smaller in size than those of the seed-bearing parent, and frequently the cotyledons were so badly developed as to make

the seed-coat appear almost empty. In the reverse crosses when the Palestine Pea was used as the seed-bearing parent, the resulting seeds of the hybrid in F_1 were very similar to those of the Palestine Pea, but sometimes of a larger size.

The main purpose of the experiments was to ascertain, if possible, the relationship of the wild Palestine Pea to the cultivated forms, and although, as the result shows, it cannot be claimed that the Palestine Pea is certainly the forerunner either of the present day Garden Peas or Field Peas, yet the fact that some of the hybrids are now fertile does not preclude such a possibility.

EXPLANATION OF THE PLATES.

PLATE **15.**

Fig. 1. Parental types of the cross.
(A) *Pisum sativum umbellatum.*
(B) The Palestine Pea.
Fig. 2. Inflorescence of the two parental forms.
(C) *Pisum sativum umbellatum.*
(D) The Palestine Pea.
Fig. 3. Pods of the two parental forms.
(E) *Pisum sativum umbellatum.*
(F) The Palestine Pea.
Fig. 4. (G) Inflorescence of New type No. 1 and inflorescences of existing *umbellatum* types for comparison.
(H) *Pisum sativum umbellatum*, white-flowered.
(I) *Pisum arvense umbellatum*, rose- and white-flowered.

PLATE **16.**

Fig. 5. Plant of new type No. 2.
6. Plant of new type No. 3.
7. Plant of new type No. 5.
8. Plant of new type No. 6.

PLATE **17.**

Fig. 9. Seeds of the parental Palestine Pea.
10. Seeds of the parental *Pisum sativum umbellatum.*
11. Seeds of various forms of "*Pisum sativum*" for comparison.
12. Seeds of various forms of "*Pisum arvense*" for comparison.
13. Seeds of new type No. 1 (dark-blossomed bi-coloured umbellate form. (Plant shown on Pl. **15.** fig. 4 G.)
14. Seeds of existing white-flowered umbellate form (the parental *Pisum sativum umbellatum*, same as fig. 10).
15. Seeds of existing rose-and-white umbellate form.
16. Seeds of new type No. 2. (Plant shown on Pl. **16.** fig. 5.)
17. Seeds of new type No. 3. (Plant shown on Pl. **16.** fig. 6.)
18. Seeds of new type No. 4. (Plant not illustrated.)
19. Seeds of new type No. 5. (Plant shown on Pl. **16.** fig. 7.)
20. Seeds of new type No. 6. (Plant shown on Pl. **16.** fig. 8.)

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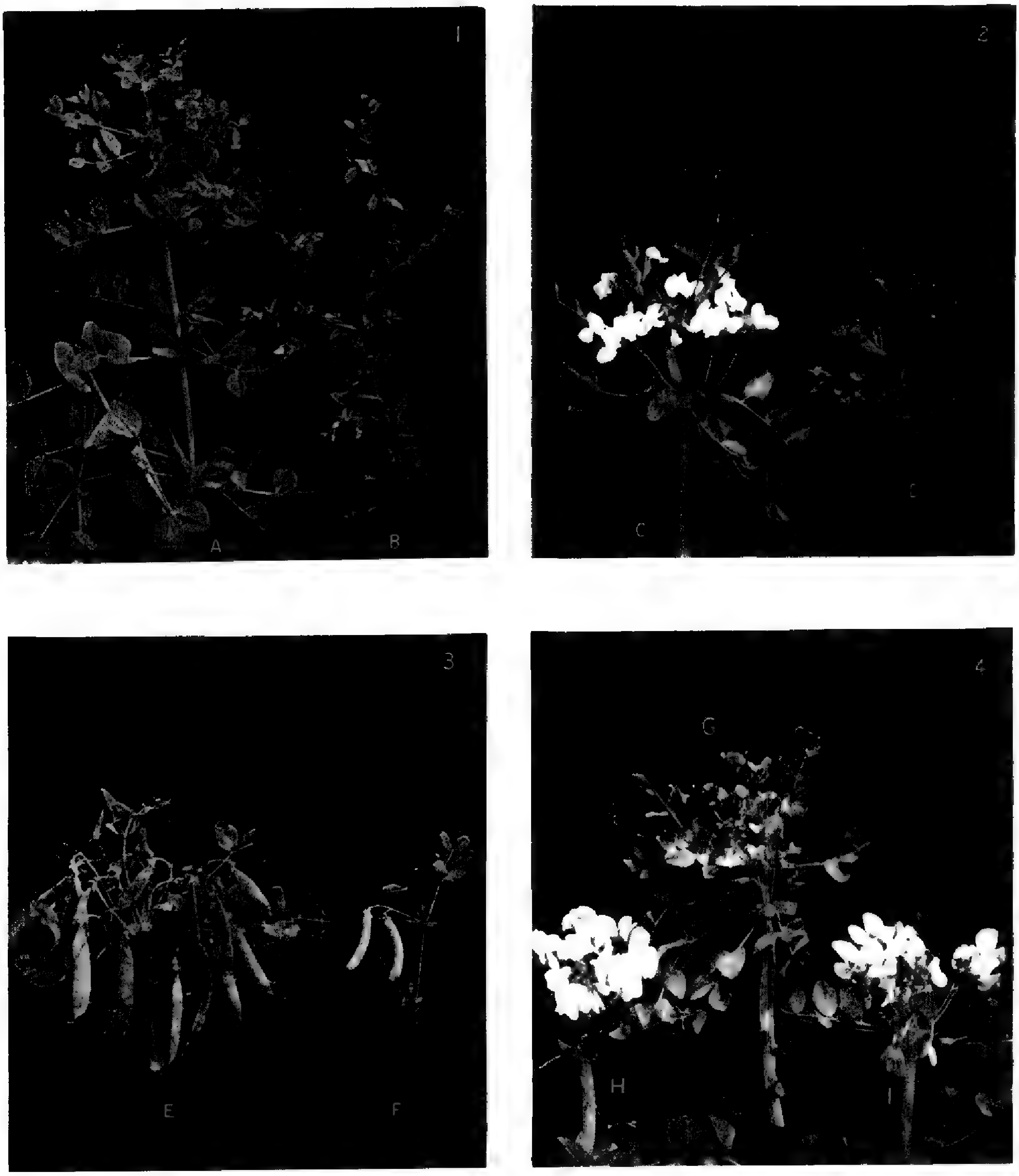

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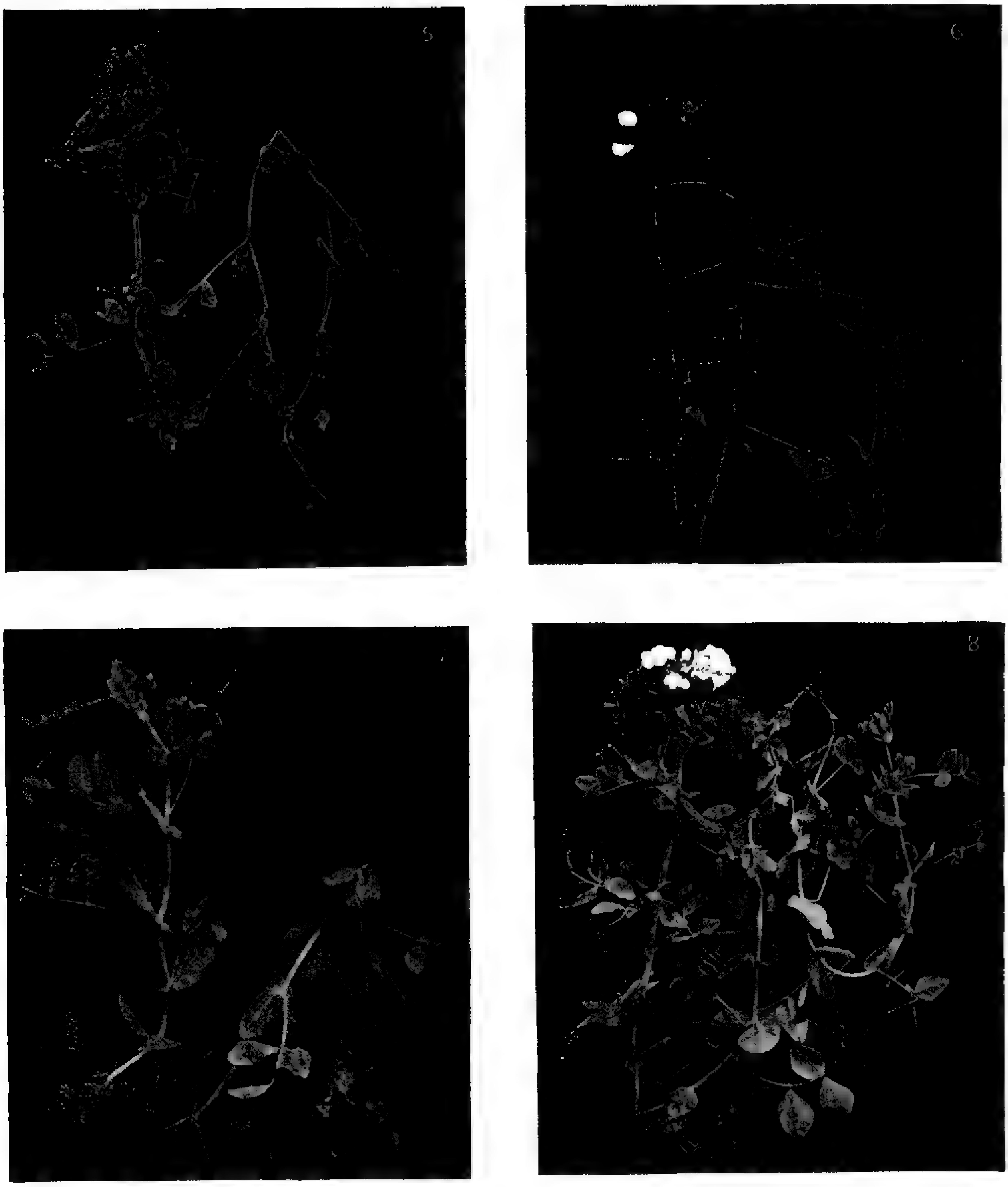

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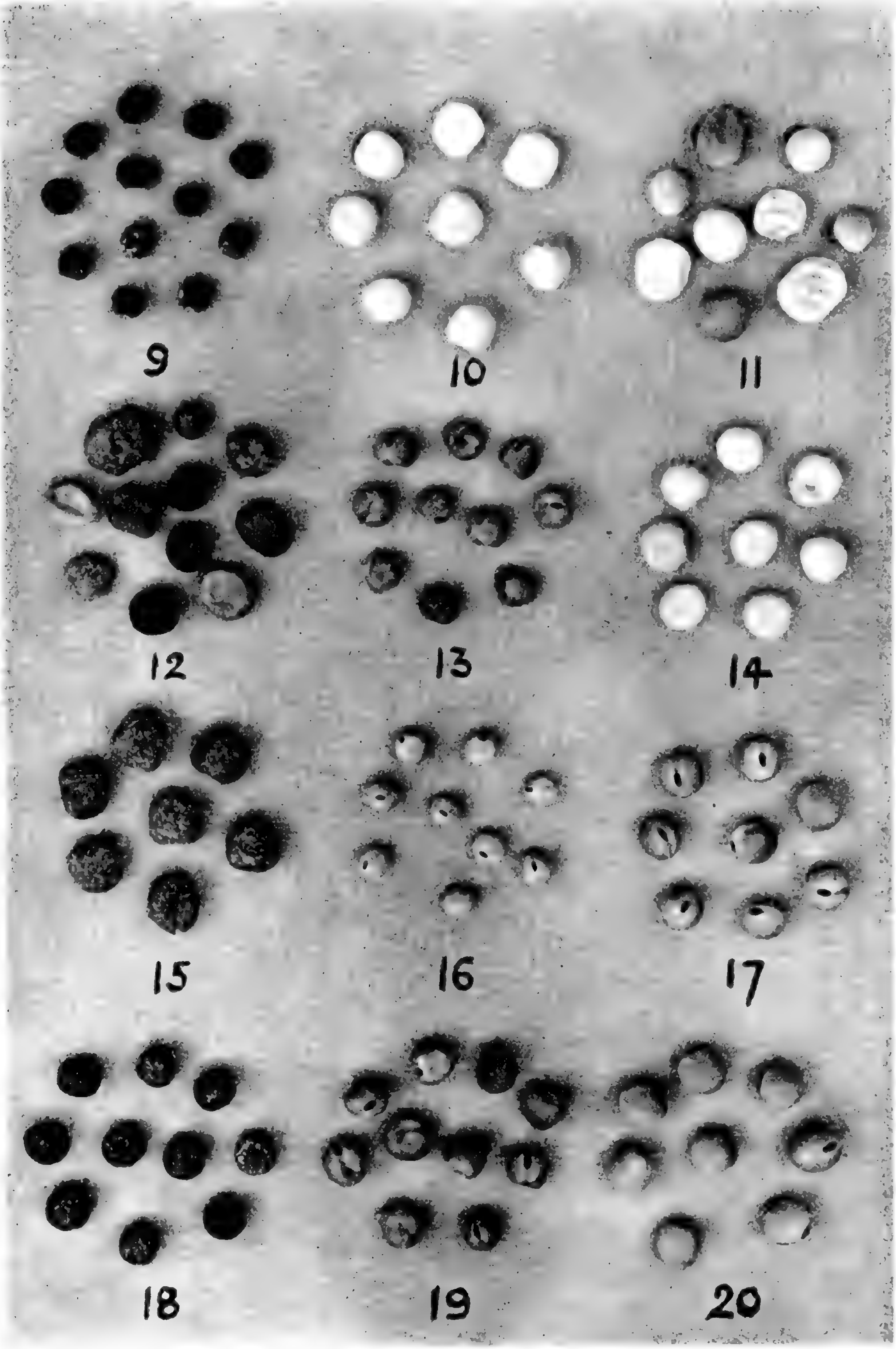

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The Flora of the Island of Shikotan.

By HISAYOSHI TAKEDA, D.I.C., Demonstrator in Botany, Imperial College of Science and Technology, London. (Communicated by Dr. OTTO STAPF, F.R.S., Sec.L.S.)

(With MAP.)

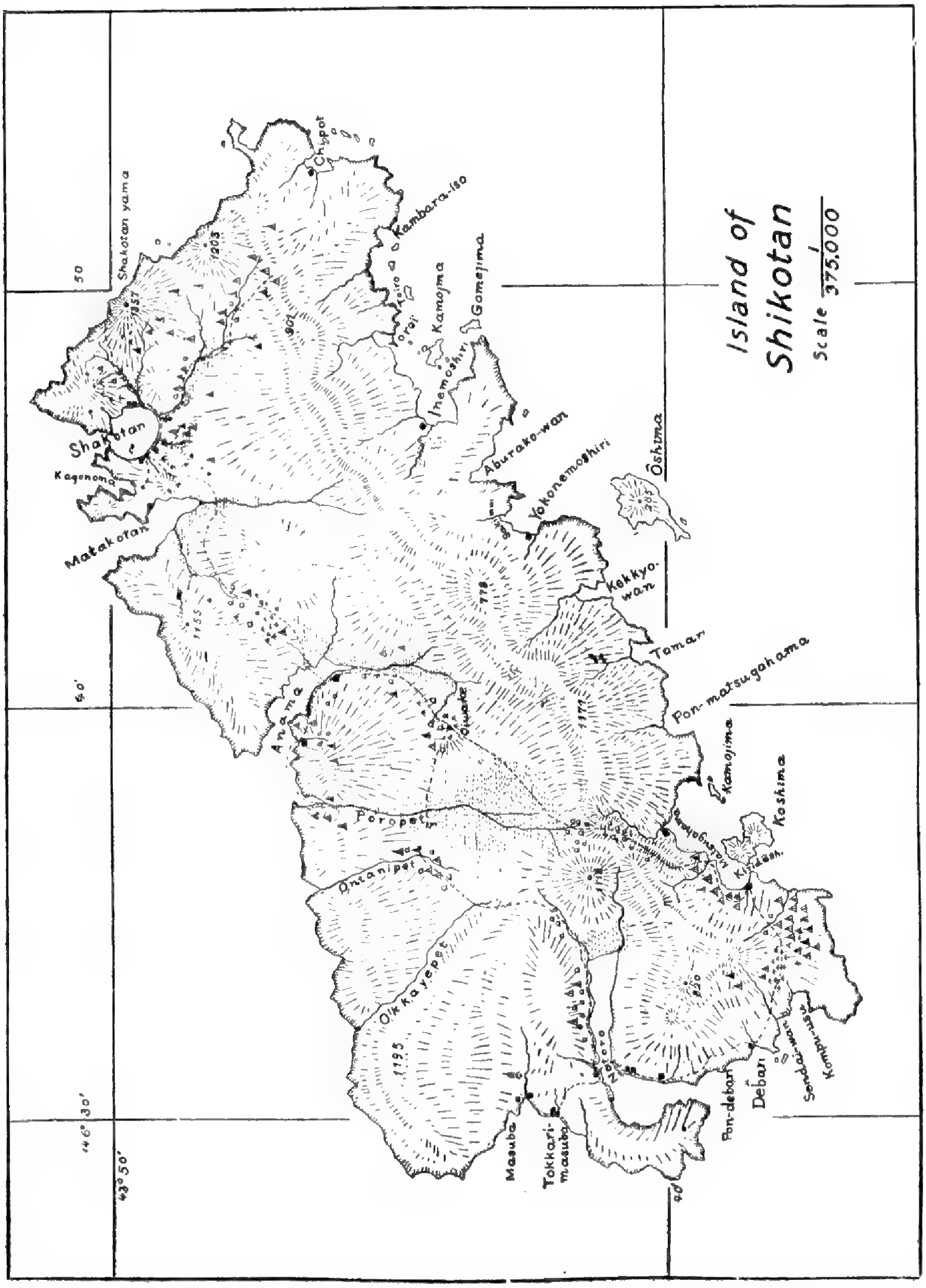
[Read 17th April, 1913.]

GENERAL FEATURES OF THE ISLAND.

SHIKOTAN is a small island lying about sixty miles off the Port of Nemuro, in the extreme east of Yezo (Hokkaidô). Its longitude extends roughly from 146° 29′ to 55′ east of Greenwich, and its latitude from 43° 35′ to 52′ N. Geologically speaking, this island really belongs to Yezo, and is also more or less connected with the latter by about a dozen small islands scattered in a row between them. Geographically speaking, however, it is situated quite close to the southern parts of the Kuriles, and is subject to similar climatic conditions, so that we may as well regard it as one of the Kurile Islands. Administratively, the island is at present included in the Kuriles; and its flora it also shares with that archipelago.

The island is oblong in form, with a very sinuous coast-line of some hundred miles, affording two good harbours and several coves. The coast is precipitous, as in the other islands of the Kuriles; sandy beaches are rather feebly developed. I have been unable to lay my hand on any reliable information about the area of our island. It would, perhaps, not exceed 140 square miles *. The surface of the island is extremely undulated with not a few mountains and many small hills. On the southern coast a range of mountains runs parallel with the long axis of the island, in which the majority of the streams have their sources. There are also several mountains on the northern coast, but they do not form a continuous range, being cut by valleys. A few others are on the eastern and western coasts. The highest mountain, Shakotan-yama, is a cone of 1357 ft. in altitude, and stands near Shakotan harbour, towering above the sea. Its north-eastern half has been almost completely removed by the action of waves and currents, resulting in an almost vertical precipice of some 1000 ft. None of these mountains is of new volcanic formation; nor are any hot springs or traces of sulphur known in the island, so that all the water, except that of bogs, is drinkable. The centre is occupied by small hills and swamps and bogs, and a section of the island would roughly be a shallow concave. The streams on the southern coast are short, and their gradient is comparatively pronounced,

* Much the same as the area of the Isle of Wight.



Nearly six miles to an inch (5·918).

while those on the northern coast are considerably longer and have a much less rapid gradient. The longest one, the Poropet—which in *Ainu* language eans large river—is about 7 miles long and flows through swamps and bogs. Although this river is quite narrow, it is said to be navigable for one-third of its length. The best harbour, Shakotan—which means the large place or village—is situated at the north-eastern corner of the island and is well protected from wind by the hills. This is the principal settlement in the whole island and is inhabited by the *Ainus* and Japanese settlers. The village-hall, to which are attached a police-station and a post-office, a school, and a small Greek Catholic church (this religion is professed by the *Ainus*), are the chief establishments at this place. Round the coast lie about a dozen fishing-stations of the Japanese, some of whom pass the winter on the island, while others come over only in the season. Roads have never been constructed on the island. Pedestrians can, however, travel along a narrow track which often vanishes into swamps or is overgrown with vegetation or interrupted by streams, and when the characteristic dense fogs envelop the island, and all the landmarks are hidden, it would be almost hopeless for the helpless traveller to proceed any farther. There is neither inn nor shop on the island; still, strangers are always welcomed by fishermen and can get accommodation for a night's rest. The coast is constantly washed by the strong cold currents which come down from the Sea of Okhotsk and from the Behring Sea, running along the whole chain of the Kuriles. A small branch of the *Kuroshio*, the warm currents, which come down through the Strait of La Pérouse, and another, which flows some distance on the south of the Kurile chain, affect the climate of the island. As to the temperature, there are no observations of any value. From November till April the island is almost locked up in ice, so that navigation during this time is absolutely impossible. In midsummer the thermometer is said to go up as high as 80° F., but a much lower temperature prevails for the greater part of the time. The sea round the island is very deep, and several species of *Laminaria* are found on the bottom. On the south-eastern coast *Porphyra umbilicalis* grows on rocks, an alga which is edible.

I may, perhaps, say a word here about those small islands mentioned above, lying between Shikotan and Yezo. Most of these have the same physiographical features as the adjacent parts of Yezo, *i. e.*, they are flat and destitute of forests. The island of Taruku, which is situated nearest to Shikotan, however, presents a similar appearance to the latter, being hilly and partly covered with woody vegetation. A comparison of the flora of these two islands would be highly interesting and valuable, but at the present moment we have to leave it out of the question, owing to the lack of any floristic record of Taruku.

History of the Botanical Exploration.

The first botanist to collect plants on this island was Prof. K. Miyabe, of Satporo, the author of the "Flora of the Kurile Islands," * who, according to his narrative, spent two hours and a half at Shakotan harbour on July 28th, 1884. The number of species he collected and observed at this place is said to be 86 †, of which 79 are enumerated in his list. Since this time several persons who had an occasion of visiting this island have made collections, and many plants have been brought back, which are additions to the flora of Shikotan. Among them, Mr. S. Yokoyama, who explored the island in August 1890 from the geological point of view, did some collecting at various places; his specimens are preserved in the Herbarium of the Agricultural College of the Tohoku Imperial University at Satporo. Mr. T. Ishikawa paid a visit to the island in June 1894, and his specimens are also at Satporo. In the next year Mr. T. Kitahara gathered some plants, which, together with those collected by him on Urup, one of the Kurile Islands, have been published by Mr. H. Matsudaira ‡. His specimens are preserved in the Herbarium of the Science College, Imperial University, Tôkyô. In August 1898, Mr. T. Kawakami spent a few hours at Shakotan in the course of his botanical exploration of Eturup and Urup. Lastly, in 1890, Mr. M. Aizawa brought back a few plants which are also preserved at Satporo. All these collectors, except Mr. Yokoyama, stopped for a few hours only at Shakotan, and did not proceed into the interior of the island.

My visit was paid in July 1909, when I was travelling in various parts of Yezo. I first arrived at Shakotan by a small steamer of about 50 tons at half past three in the morning on the 15th. At Shakotan I botanized in the neighbourhood and also made an ascent of Shakotan-yama. After three days' stay I went over to Anama, about 10 miles west of Shakotan, where very good accommodation was offered to me by the kindness of Mr. and Mrs. Arai, who possessed a fishing station there. Here I explored the neighbourhood, now on the hills, and then on the rocky cliffs. While I was at Anama, one day a good opportunity was offered to me for going by boat to the mouth of the Poropet, where, besides many other interesting plants, I collected some which I came across nowhere else. From Anama I made an excursion to Tokkari-Masuba, another fishing cove some 15 miles west of this place, whence to Debari, along the coast, and then round the bottom of Kompu-usu-yama to Kiridôshi and Matsugahama through a magnificent forest of the Kurile larch, which is known only from this district on the island. From

* Publ. in Mem. Boston Soc. Nat. Hist. vol. iv. no. 7, 1890.

† *L. c.* p. 205.

‡ "List of Plants collected in Kurile Islands by T. Kitahara," in Tôkyô Bot. Mag. ix., 1895.

here I returned to Anama, traversing the great swamp of Poropet. I visited Tokkari-Masuba by boat again and collected more specimens. In consequence of various hindrances, I was unable to explore the greater part of the southern side of the island, so that the vegetation of those parts between Matsugahama and Chipoi is practically unknown except from a few specimens collected by Mr. Yokoyama, which I have had an opportunity of examining. However, I do not expect that that district contains any considerable number of plants peculiar to it.

As the result of a fortnight's exploration, I gathered a little over 300 species of Phanerogams and Pteridophyta on Shikotan. Afterwards, through the kindness of Mr. and Mrs. Arai, who indefatigably collected plants for me at different seasons in the vicinity of Anama, I received about 300 specimens, some of which were not only very valuable, but also formed an addition to my own collection.

Brief Sketch of the Vegetation.

Before we pass on to the consideration of the floristic character of the island, I may perhaps give here a brief account of the vegetation. The Kurile Islands are a very interesting subject for physiographical ecology, because their vegetation is quite primæval and no artificial alterations have ever been made. In particular, Shikotan has scarcely been touched by human hands at all. No attempt at reclamation has been attempted. Only a very small area is cultivated, without much success, with peas, potatoes or something of the sort, which is quite negligible. Comparatively few trees have been felled for building purposes or for fuel; what has been done in this direction has left the virgin forest practically intact. A few herbaceous plants have been introduced by human agency around the fishing-stations, yet these have not affected the aspect of the original vegetation.

As has already been mentioned, sandy beaches are not common, and they are only feebly developed in bays and estuaries. The dominant plants in sand quite close to the sea are :—*Elymus mollis*, *Mertensia maritima* subsp. *asiatica*, *Linaria japonica*, *Lactuca repens*, *Carex pumila*, *C. macrocephala*, *Ammodenia peploides* var. *oblongifolia*, *Lathyrus maritimus*, *Salsola Soda*, and *Phellopteris littoralis*. Just inside the zone of these plants and often amongst stones and rocks one generally sees :—*Artemisia Stelleriana*, *Thermopsis fabacea*, *Potentilla Anserina*, *Senecio Pseudo-arnica*, *Galium verum*, *Geranium yezoense*, *Matricaria ambigua*, *Plantago camtschatica*, and occasionally *Swertia tetrapetala*. *Rosa rugosa*, with its magnificent flowers of bright crimson, forms bushes in this formation. On the bottom of shallow estuaries *Zostera pacifica* and *Phyllospadix Scouleri* grow in abundance, while on their muddy or sandy banks we come across *Triglochin maritimum*, sometimes *Atropis kurilensis*, and the familiar boreal plant *Glaux maritima*.

Hills and mountains are, to a great extent, covered with dwarf bamboos—species of *Sasa*—with which occur other grasses and sedges. Occasionally the prostrate variety of *Juniperus chinensis*, or a straggling wild vine form deep-green patches on slopes. Where bamboos form dense thickets no other plants seem to be able to grow, since their evergreen foliage cuts off a great deal of light. Where the growth of the bamboo is thin or not dominant, the deep orange colour of *Hemerocallis Middendorffii*, the large blue flowers of *Iris setosa*, and the deep crimson *Pedicularis japonica*, or occasionally the purple-flowered *Geranium erianthum* and the white *Sanguisorba tenuifolia* adorn the hill-sides. Such plants as *Senecio palmatus*, *Cœlopleurum Gmelini*, and *Pleurospermum austriacum*, which generally grow luxuriantly in Northern Japan, do not here attain any conspicuous size, nor does the thick-growing *Miscanthus* play any considerable part in plant-formations. On the grassy slopes we also find a large-flowered variety of *Ranunculus acris*, *Dianthus superbus*, *Parnassia palustris*, *Polygonum viviparum*, *Patrinia scabiosifolia*, the insignificant *Rubia grandis*, and the light-demanding orchids, which are particularly rich in species of *Platanthera*. In the late spring or early summer one would enjoy the delicious scent of the lily of the valley, which is, however, only found on the eastern coast.

The exposed places, and particularly the rocky cliffs on the sea-side, well deserve to be called alpine gardens. Owing to the universal growth of the bamboo all over the island, these more delicate plants are naturally restricted to the exposed rocks towards the sea. Here, on the upper edge of the cliffs, one finds such flowers as *Anemone narcissiflora*, *Leontopodium kurilense*, *Trientalis europæa* var. *arctica*, *Cornus canadensis*, *Saxifraga bronchialis* var. *cherlerioides*, *S. reflexa*, *Draba borealis*, *Erigeron salsuginosus*, *Stellaria ruscifolia*, *Empetrum nigrum*, *Vaccinium Vitis-idæa*, *Hedysarum obscurum* var. *neglectum*, *Tofieldia nutans*, *Oxytropis retusa*, *Mertensia rivularis* var. *japonica*, *Silene repens* var. *latifolia*, *Pedicularis venusta*, *Sedum Rhodiola*, *S. kamtschaticum*, *Selaginella helvetica*, *Androsace Chamæjasme* var. *arctica*, and particularly, lower down by the sea, *Artemisia Schmidtiana*, *Conioselinum kamtschaticum*, *Cerastium boreale*, and *Ligusticum scoticum*.

Two kinds of forests may be classified: one of deciduous trees, and the other of conifers. The most important species of deciduous trees are *Betula Ermani* and *Alnus incana*. The former usually grows in drier situations, whereas the latter is found in more moist localities. They often form pure forests or are sometimes mixed together. Occasionally a small amount of *Acer pictum*, *Salix Caprea*, *Alnus Alnobetula*, *Sorbus commixta*, or *Phellodendron amurense* takes a share. Under the forest trees we generally find *Sasa paniculata*, with which no other plant will grow. Of conifers *Abies sachalinensis* is the most widely distributed. Often a single or a few isolated trees are found on hills, but usually it grows forming dense forests, occasionally in association with *Picea ajanensis*. Inside the dreary coniferous

forests only a few shade-loving plants can thrive, viz., *Leucothoë Grayana*, *Listera cordata*, *L. nipponica*, *Ephippianthus Schmidtii*, *Galium triflorum*, *Vaccinium præstans*, *Circæa alpina*, *Oxalis Acetosella*, *Clintonia udensis*, *Ribes latifolium*, *Athyrium pterorachis*, and *Athyrium Filix-fœmina*. On the margin of the forest one comes across *Aralia spinosa*, *Lonicera Maximowicziana*, *Pæonia obovata*, *Ægopodium alpestre*, and *Spiræa media*. In the south-western corner of the island there is a beautiful forest of the famous *Larix kurilensis*. This tree is not very tall, and some are even quite stunted though they are old and have thick trunks.

Along the mountain-streams *Filipendula kamtschatica*, *Cnicus kamtschaticus*, *Cacalia hastata*, *Artemisia vulgaris*, *Eupatorium sachalinense*, *Aruncus sylvester* var. *kamtschatica* are generally met with, and occasionally the tall *Petasites japonicus* var. *giganteus*. The largest specimen of the *Petasites* I saw had a petiole about 6 feet long, and the lamina about 5 feet across. There are two most noxious plants especially occurring abundantly near the streams. One is *Urtica platyphylla*, and the other is *Phalaris arundinacea*. The latter grows as high as 6 feet or sometimes more, and is so dense that the traveller cannot see the lower part of his body, nor where he is walking. In their lower reaches the streams are often lined with *Salix opaca*, a species which is very fond of moist places, and sometimes with *Alnus incana*.

The vegetation of the mountains does not differ very much from that of the hills. The greater part of the mountains is covered with bamboos, as already mentioned. As one approaches the summit one sees very dwarf specimens of *Alnus incana*, *A. Alnobetula*, and the almost creeping *Salix Reinii*, which are often not more than 2 feet in height. In rocky and more or less exposed places one comes across plants which are also found on the rocky cliffs near the sea. I also saw abundant growth of *Lycopodium clavatum* and *Cryptogramme crispa*, which do not seem to occur near the sea, while, on the other hand, such cliff-plants as *Artemisia Schmidtiana*, *Conioselinum kamtschaticum*, and *Ligusticum scoticum* are not found on the mountains. Nor have I seen such plants of alpine character as *Geum calthifolium* var. *dilatatum*, *Polygonum polymorphum* var. *ajanense*, and *Rhododendron chrysanthum* near the sea; they are confined to the mountain summits.

Swamps are characterized by the presence of *Carex cæspitosa* var. *minuta*, the dense tufts of which form a sort of stepping stones, which help one in crossing swampy places. Another dominant plant is a huge aroid, *Lysichiton camtschatcense*, with its rosette of long and broad leaves. Sphagnum bogs harbour a variety of beautiful flowers. Characteristic elements of this vegetation are *Eriophorum vaginatum*, *Oxycoccus palustris*, *Drosera rotundifolia*, *Galium trifidum*, *Ledum palustre* var. *dilatatum*, *Spiræa betulifolia*, *S. salicifolia*, *Menyanthes trifoliata*, *Epilobium lineare*, *Veratrum album*, *Gentiana jesoana*, *Potentilla fruticosa*, *Clematis fusca* var. *kamtschatica*, *Ilex crenata*, *Lathyrus palustris*, and often *Geranium erianthum*.

Character of the Flora.

The number of the Spermophytes and Pteridophytes from this island, according to my collection and to that made by others mentioned above, is 324, four times as many as were previously known, and a little in excess of the number of plants from the whole Kurile group enumerated in Miyabe's catalogue. These 324 species belong to 213 genera and 62 families, which arrange themselves as follows :—

	Families.	Genera.	Species.
Polypetalæ	23	78	114
Gamopetalæ	16	60	85
Monochlamydeæ	7	12	20
Dicotyledones	46	150	219
Monocotyledones	9	46	81
Angiospermæ	55	196	300
Gymnospermæ	2	5	5
Spermophyta	57	201	305
Pteridophyta	5	12	19
Total	62	213	324

Among these 62, the following families are comparatively rich in genera :—

Compositæ	with 21 genera.
Gramineæ	,, 18 ,,
Rosaceæ	,, 13 ,,
Umbelliferæ	,, 11 ,,
Ranunculaceæ, Liliaceæ	,, 9 ,,
Caryophylleæ, Polypodiaceæ, Leguminosæ	,, 8 ,,
Orchideæ	,, 7 ,,
Cruciferæ	with 6 genera.
Scrophularineæ, Primulaceæ	,, 5 ,,
Saxifragaceæ, Labiatæ, Ericaceæ, Geraniaceæ, Caprifoliaceæ, Pinaceæ	,, 4 ,,

The following table shows those families which are comparatively rich in species, with their relative share in the Flora of Shikotan :—

Compositæ	with 34 species	=	10·5 per cent.
Gramineæ	,, 26 ,,	=	8·0 p. c.
Rosaceæ	,, 22 ,,	=	6·8 p. c.

Cyperaceæ Ranunculaceæ	with	17	species	=	5·3 p. c.
Orchideæ	,,	14	,,	=	4·3 p. c.
Caryophylleæ	,,	13	,,	=	4·0 p. c.
Umbelliferæ	,,	12	,,	=	3·7 p. c.
Polypodiaceæ	,,	11	,,	=	3·4 p. c.
Liliaceæ Leguminosæ	,,	10	,,	=	3·1 p. c.
Cruciferæ Saxifragaceæ Polygonaceæ	,,	8	,,	=	2·5 p. c.
Scrophularineæ Rubiaceæ	,,	7	,,	=	2·2 p. c.
Onagrariæ Juncaceæ	,,	6	,,	=	1·9 p. c.
Ericaceæ Caprifoliaceæ Primulaceæ	,,	5	,,	=	1·6 p. c.
Labiatæ Vacciniaceæ	,,	4	,,	=	1·3 p. c.

The larger genera which contain three species and upwards are :—

with 3 species : *Anemone*, *Viola*, *Spiræa*, *Vaccinium*. *Pedicularis*, *Salix*, *Lycopodium*, and *Dryopteris* ;
with 4 species : *Potentilla*, *Saxifraga*, *Senecio*, and *Juncus* ;
with 5 species : *Stellaria*, *Epilobium*, *Galium*, and *Poa* ;
with 6 species : *Polygonum* ;
with 7 species : *Artemisia* and *Platanthera* ;
with 15 species : *Carex*.

There are 28 families represented by a single genus, and 23 of these by a single species. These are :—*Violarieæ, Hypericineæ, Ternstrœmiaceæ, Rutaceæ, Ilicineæ, Ampelideæ, Aceraceæ, Anacardiaceæ, *Crassulaceæ, Droseraceæ, Lythrarieæ, Araliaceæ, *Cornaceæ, Diapensiaceæ, Oleaceæ, Solanaceæ, *Plantagineæ, Santalaceæ, Urticaceæ, *Salicineæ, Empetraceæ, Taxaceæ, Irideæ, Scheuchzeriaceæ, *Lycopodiaceæ, Selaginellaceæ, *Equisetaceæ, and Ophioglossaceæ (those represented by more than one species are indicated by an asterisk).

On account of the geographical position of Shikotan, one would expect to find in this island a larger number of representatives of the southern floras

than in any other of the Kurile Islands, and at the same time anticipate that not a few plants characteristic of a colder climate had established themselves on this island. This is actually the case. The following comparative table will show the number of species and the relative percentage common to Shikotan and some neighbouring districts. It should, however, be borne in mind that, owing to the scanty floristic data of other islands and especially of the northern Kuriles, the following numbers may require hereafter a slight alteration :—

Hontô (the main island of Japan)...........	264 species	=	81·5 per cent.
Sakhalien..	253 ,,	=	78·1 p.c.
Yezo	298 ,,	=	92·0 p.c.
S. Kuriles (Kunnashiri up to Chiripoi) ...	239 ,,	=	73·8 p.c.
N. Kuriles (Shimoshiri up to Shumshu) ...	113 ,,	=	34·8 p.c.

35 species or 10·8 per cent. of the Shikotan Flora are mainly distributed in the Archipelago of Japan (a few are, however, known to occur, though rarely, in Corea). There are 8 species endemic in the Kurile Islands. It is very interesting to notice that 42 species are known from Hontô and Yezo, but not from Sakhalien. 34 species are known to occur in Sakhalien and Yezo, but not in Hontô The following 4 species have not been recorded from either Hontô or Yezo, but from Sakhalien ; they are :—*Silene repens*, *Sagina saginoides*, *Epilobium lineare*, and *Thesium repens* ; while *Oxyria digyna* and *Clintonia udensis* are found in Hontô as well, but not in Yezo. There are also 5 species occurring only in the Kuriles and Yezo, but not in Sakhalien or Hontô, and one of them—*Geranium yezoense*—is endemic in this district ; they are :—*Geranium yezoense*, *Mertensia rivularis*, *Euphrasia mollis*, *Artemisia laciniata*, and *Patrinia sibirica*. It is also worth while to notice that *Isatis oblongata*, *Cnicus kamtschaticus*, *Androsace Chamæjasme*, and *Poa cenisia* are known from nowhere else in Japan but the Kuriles. These are distributed over north-eastern Asia and the Aleutian Islands, and a few of them are found in Alaska as well. Lastly, I may perhaps mention here that *Platanthera minor* and *Galium triflorum* are found in Hontô, but have not been recorded from Yezo. While the *Galium* occurs in North America, the *Platanthera* is endemic in Japan.

Of those 324 species we now know from Shikotan, 144 species, including my 8 new species and one variety, are not mentioned in Miyabe's Flora, while 58 genera and 11 families are additions to that publication. In my list, given in the following pages, all the additional families, genera, and species are indicated with an asterisk, notwithstanding that some of them have been published elsewhere.

To deal with the relationship of the flora of Shîkotan alone to that of other parts of the world would be of little value, unless the whole Kurile Islands

were taken into account. Miyabe arrived at the conclusion that "at the time of the last great southerly migration of the rich polar flora, Japan received few, if any, plants through the then uncompleted chain of the Kurile Islands" *. If so, how could one explain the occurrence of those plants † which have not been found in Sakhalien, but are distributed over north-eastern Asia, the Aleutian Islands, etc., and the Kuriles as well as Yezo, and even farther south in Hontô (on high mountains)? At the same time, certain plants ‡ which have their head-quarters in North Japan, but are not known from Sakhalien, are nevertheless met with in the Kuriles. The examples given below are taken only from the Shikotan Flora, but if I were allowed to take other islands of the Kurile group into consideration, I could certainly give many more instances. It is also of great interest, as well as of much importance, to compare the flora of the alpine region of the high mountains in Central and Northern Japan with that of the Kuriles and of Sakhalien. There is no room at present to discuss this point in detail; but, so far as I can say with certainty, the alpine flora of Japan is very much of an arctic character, and the plants representing it are by no means always met with in Sakhalien. Confining ourselves to the island of Shikotan, we have there a good many plants common to it and Yezo or to Yezo and Hontô, but not found in Sakhalien. Miyabe's theory would be sufficient to explain the presence of the plants common to Japan and Sakhalien, but not the occurrence of the elements which are found in Japan and the Kuriles, yet absent from Sakhalien. Those which are not found in Sakhalien must have come through the Kuriles, or, at any rate, must have been equally distributed over these particular districts, either when they were compelled to migrate towards south, or when they returned north after the amelioration of the climate. Taking examples from Shikotan alone, we know that there are 42 species occurring in Yezo and Hontô as well, but not in Sakhalien, and some of them even belong to a comparatively warmer climate.

These facts show how intimately the Kurile Islands are connected with Hontô through Yezo, and much less so with Sakhalien. I may also mention here that the flora of Yezo has a closer relationship to that of Hontô than to that of Sakhalien. It was put forward by Blakiston § that Yezo and

* Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 212.

† For example:—*Stellaria ruscifolia*, *Geum calthifolium*, *Erigeron salsuginosus*, *Arnica unalaschkensis*, *Swertia tetrapetala*, *Polygonum viviparum*, *P. polymorphum*, *Euphrasia mollis*, *Platanthera chlorantha*, *P. Chorisiana*, *Cnicus kamtschaticus*, *Carex scita*, and *Clematis fusca*.

‡ E. g., *Anemone Taraoi*, *Maackia amurensis* var. *Buergeri*, *Saxifraga cortusifolia*, *S. fusca*, *Leucothoë Grayana*, *Primula modesta*, *Syringa amurensis* var. *japonica*, *Pedicularis japonica*, *Salix Reinii*, *Carex Wrightii*, *Taxus cuspidata*, etc.

§ T. W. Blakiston, "Zoological Indications of Ancient Connection of the Japan Islands with the Continent," in Trans. Asiat. Soc. Japan, xi. (1883) pp. 126–140.

Sakhalien formed a peninsula projecting from the Asiatic Continent, while Hontô had been cut off from this peninsula at an earlier period by the Strait of Tsugaru. Thus Tsugaru Strait forms a decided line of demarcation between the fauna of Hontô and that of Yezo, and the latter island contains practically the same species of animals as those found on continental Asia. This hypothesis has been valued by zoologists, and the Strait of Tsugaru has consequently been called the "Blakiston Line." It is quite true that the "Blakiston Line" has some bearings on the distribution of plants on Yezo, as it has on the fauna. However, if we closely examine the floras of Hontô, Yezo, the Kuriles, and of Sakhalien, we are unable to appreciate Blakiston's disregard of the importance of the Strait of La Pérouse. As I have shown above, the flora of the Kuriles is more closely related to that of Hontô than to that of Sakhalien. And so is the flora of Yezo. So far as the botanical evidence shows, La Pérouse Strait is the primary line of demarcation, and Tsugaru Strait the secondary. It is true, as Blakiston mentions, that the Strait of La Pérouse is shallower than the Strait of Tsugaru; but in my opinion very little value can be attached to the depth or breadth of the water separating an island from the main land or two islands from one another, for determining the period when the land in question became disconnected. It would be astonishing if one finds that the flora of Quelpaert or Che-ju Island is more closely related to that of Japan than that of the Corean Peninsula *. As I have pointed out above, botanically speaking, the Kurile Islands are closely connected with Yezo. Geographically, their southern parts seem to have been once in more intimate connection. As to the northern islands, Milne † advanced an opinion of their very recent formation. His hypothesis was followed by Miyabe ‡, who considers that Yezo had connection with the Asiatic Continent only through Sakhalien. The floristic evidence, however, does not point that way. I have therefore been led to the conclusion that the Northern Kuriles have been in existence before the Strait of La Pérouse was formed, and that this had some effect on the distribution of plants. It must be borne in mind that volcanic activity in the Northern Kuriles has not always been constructive, but also destructive, and that the geographical features must have varied in consequence. In order to arrive at a more correct calculation I should have to consider the whole Kurile flora, the material for which, however, I have not at present at my

* There is no extensive phytogeographical work of this island. Its floristic relationship may, however, be seen to some extent in the paper "Plantæ ex insula Tschedschu," by Takeda and Nakai, in Tôkyô Bot. Mag. xxiii., 1909.

† J. Milne, "Evidences of the Glacial Period in Japan," in Trans. Asiat. Soc. Japan, ix. (1881) pp. 53–85.

‡ Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 212.

disposal. It is also a cause of great regret that no flora or even list of plants growing on Yezo has been published, to which I could refer, except in the form of some fragmentary records. When the flora of Yezo and that of the Kuriles will have been thoroughly worked out, more evidence upon the subject will be available, and my hypothesis will, I hope, be confirmed.

In my list of the Shikotan Plants, given in the following pages, Bentham and Hooker's system is adopted on the whole. The citation of the literature under the species and varieties is restricted to more important works. Besides certain general works, reference is also made to some of the principal floras of the neighbouring countries. The following publications, which deal with Hokkaidô (Yezo) plants, are frequently referred to :—

1. MIYABE, K.—The Flora of the Kurile Islands, in Mem. Boston Soc. Nat. Hist. iv. 1890.
2. MATSUDAIRA, H.—List of Plants collected in Kurile Islands by T. Kitahara, in Tôkyô Bot. Mag. ix. 1895.
3. YABE, Y., and K. YENDÔ.—Plants of Shumshu Island, *ibid.* xviii. 1904 (in Japanese).
4. TAKEDA, H.—Beiträge zur Kenntnis der Flora von Hokkaidô, *ibid.* xxiv.-xxv. 1910–11.
5. —— Lycopodialen Hokkaidôs nebst denen von Japanisch-Sachalin, *ibid.* xxiii. 1909.

The accompanying Table of Distribution of the Shikotan Plants (pp. 500–508) is constructed so as to show all the species, subspecies, varieties, and sometimes forms, occurring in the three larger islands of Japan, the principal islands of the Kuriles, where plants have been collected, the adjacent countries in Eastern and North-eastern Asia, and North America and Europe. For this purpose I have carefully consulted the numerous floristic works of those districts, as well as specimens preserved in the Kew Herbarium. As to the data concerning the Kuriles, and especially of those other than Shikotan, I am deeply indebted to Professor K. Miyabe for the privilege of working in the Herbarium of the Agricultural College, Tohoku Imperial University, Satporo, and for placing all his unpublished notes and specimens at my disposal (1909). To Professor J. Matsumura I tender my sincere thanks for giving me the opportunity of examining the specimens collected by Mr. T. Kitahara and enumerated by Mr. H. Matsudaira, which are preserved in the Herbarium of the Science College, Tôkyô Imperial University (1909). I also take this opportunity of thanking Lieut.-Col. Sir David Prain and Dr. Otto Stapf for their courtesy in allowing me to use the Herbarium and Library of the Royal Botanic Gardens, Kew (1910–12).

The map on p. 436 has been based on five different Japanese maps,

and also been slightly modified from the author's own observations. It is, however, not pretended to be very accurate. The dotted lines indicate the approximate route traversed by the author in July 1909. A few symbols are used occasionally to show the general character of the vegetation, thus: ▲ for Conifers, ○ for deciduous trees, ∧ for bamboos; and some other features such as ⁚⁚ for bogs and swamps, and ▒ for sandy beaches. For the use of the asterisk *, see page 444.

ENUMERATIO PLANTARUM IN INSULA SHIKOTAN SPONTE NASCENTIUM.

DICOTYLEDONES.

POLYPETALÆ.

1. RANUNCULACEÆ.
(Gen. 9, spp. 14.)

1. Clematis.

1. C. FUSCA, *Turcz.*, var. KAMTSCHATICA, *Takeda, in Beiträge*, no. 44, *in Tôkyô Bot. Mag.* xxiv. (1910) p. 237.

Syn.: *C. fusca*, Trautv. et Mey. Fl. Ochot. p. 5.
C. fusca α. kamtschatica, β. Middendorffii, γ. ajanensis, Regel et Til. Fl. Ajan. p. 19.
C. fusca α. kamtschatica, β. ajanensis, Regel, Tent. Fl. Uss. p. 2.
C. ajanensis, O. Kuntze, Monogr. Clemat. p. 176.

Hab. Shakotan, Anama; on wet hillsides.

2. Thalictrum.

*2. (1.) T. SACHALINENSE, *Lecoy. Monogr. Thalictr.* p. 77, tab. 3. fig. 6; *Takeda, in Journ. Bot.* xlviii. (1910) p. 265.

Syn.: *T. akanense*, Huth, in Bull. Herb. Boiss. v. (1897) p. 1069; Boissieu, in Bull. Herb. Boiss. vii. (1899) p. 585.
T. minus var., Matsudaira, List, no. 25, *non* Linn.

Hab. Shakotan, between Shakotan and Chipoi; in grassy places.

Obs. Nostra specimina *caule* gracili, ca. 36 cm. alto, superne pauciramoso; *foliis* biternatis longe petiolatis, stipulatis et stipellatis, foliolis petiolulatis, subrotundatis, basi rotundatis vel subcordato-rotundatis, apice trilobatis raro tripartitis, lobis lobulatis; *inflorescentia* terminali, subcorymbosa, pedicellis bracteolatis; *floribus* majusculis, sepalis 4–5, ovalibus, integris, 3–4 mm. longis, ca. 2 mm. latis, coloratis; *filamentis* apice clavato-dilatatis, fere

6 mm. longis; *carpellis* numerosis, 10 et ultra, sessilibus, stylo circinato; *acheniis* breviter stipitatis, 4–5 mm. longis, 6-costatis.

Statura *T. aquilegifolio* similis, quod acheniis longissime stipitatis, pendulis, alatis quadrangularibusque facile distinguitur.

3. (2.) T. MINUS, *Linn.*, var. NANUM, *Lecoy. Monog. Thalictr.* p. 127; *Miyabe, Fl. Kuril.* p. 214, excl. syn.; *Boissieu, in Bull. Herb. Boiss.* vii. (1899) p. 587; *Takeda, in Tôkyô Bot. Mag.* xxiv. (1910) p. 265.

Hab. Shakotan, Anama; on exposed rocky cliffs.

3. ANEMONE.

4. (1.) A. DEBILIS, *Fisch. apud Turcz. in Bull. Mosc.* xxvii. (1854) p. 274; *Maxim. in Mél. Biol.* ix. p. 607; *Franch. et Sav. Enum. Pl. Jap.* ii. p. 265.

Syn.: *A. ranunculoides* var. *gracilis*, Schlecht. in Linnæa, vi. (1831) p. 574.
A. cærulea var. *gracilis*, Ledeb. Fl. Ross. i. p. 14; Regel, Pl. Radd. i. p. 15.
A. gracilis, Fr. Schmidt, Reis. Amurl. Sachal. p. 102.
A. cærulea varr. *debilis* et *gracilis*, Huth, in Bull. Herb. Boiss. v. (1897) p. 1074; Boissieu, l. c. pp. 589–590.

Hab. Shakotan; in shady woods.

5. (2.) A. NARCISSIFLORA, *Linn.*, var. VILLOSISSIMA, *DC. Prodr.* i. p. 22; *Miyabe, l. c.* p. 215.

Hab. Summit of Shakotan-yama, Anama; on exposed grassy slopes.

Obs. My specimens agree very well with those referred to in Fl. Kuril. by Miyabe. The pubescence is rather thin.

*6. (3.) A. TARAOI, *Takeda*, var. KURILENSIS, *Takeda, in Journ. Bot.* xlviii. (1910) p. 266.

Syn.: *A. patens* var. *hirsutissima* subvar. *Taraoi*, Makino, in Tôkyô Bot. Mag. xvii. (1903) p. 39.
A. hirsutissima var. *Taraoi*, Makino, l. c. xviii. (1904) p. 69.
A. patens var. *intermedia*, Yabe et Yendô, Pl. Shum. p. 182, *non* Regel.

Hab. Summit of Shakotan-yama; rare.

4. RANUNCULUS.

7. (1.) R. ACRIS, *Linn.*, var. STEVENI, *Ledeb. Fl. Ross.* i. p. 41; *Regel et Til. Fl. Ajan.* p. 32; *Regel, l. c.* p. 7, in adnot.; *Maxim. Fl. Mongol.* p. 21.

Syn.: *R. acris* subsp. *Steveni*, Korsch. Pl. Amur. p. 297.
R. acris var. *grandiflorus*, Regel, l. c.; Pl. Radd. i. p. 48.
? *R. borealis* var. *glabrescens*, Freyn, in Œsterr. Bot. Zeitsch. li. (1901) p. 379.

Hab. Shakotan, Anama, vicinity of Notoro; in grassy fields.

*8. (2.) R. REPENS, *Linn. Sp. Pl.* p. 557; *Franch. et Sav. Enum. Pl. Jap.* i. p. 8; *Yabe et Yendô, Pl. Shum.* p. 181.

Hab. Shakotan; in wet places.

*5. CALTHA.

*9. C. PALUSTRIS, *Linn.*, var. GIGAS, *Léveillé, in Fedde, Repert.* 1909, p. 102.

Syn.: *C. palustris α. typica*, Fr. Schmidt, Reis. Amurl. Sachal. p. 105, forsan non Regel.

Planta robusta. *Caulis* basi 1·5 cm. diametro, fructifer ultra 6 dm. altus, ramosus. *Folia* orbiculato-reniformia, circumcirca argute calloso-dentata, in sicco membranacea, radicalia longe petiolata, profunde cordata, lobis basilaribus conniventibus, caulina inferiora longe, superiora breviter petiolata, sinu aperto. *Flores* plures in umbellam pauci-(2–4)-radiatam basi plerumque bracteis 2 instructam dispositi, 3–4 cm. diametro; *bracteis* sessilibus, majusculis, flabellato-orbiculatis, argute profundeque dentatis; *pedunculis* initio brevibus ad 3 cm. longis, post anthesin valde elongatis; *carpellis* usque 12, submaturis erectis.

Hab. Anama, along the Ontanipet; in wet and more or less shady places.

Obs. Our plant is possibly identical with Léveillé's var. *gigas*, the description of which is so simple and short, so it is rather difficult to refer it to it with absolute certainty. In other islands of the Kuriles var. *sibirica*, Regel, has been collected.

*6. ACONITUM.

*10. A. KURILENSE, *Takeda*, sp. nov.

Planta valde variabilis. *Tuber* parvum, obconicum. *Caulis* aut 14–30 cm. altus, gracilis, aut usque 50 cm. altus, in speciminibus luxuriantibus usque 10 dm. altus, firmus, semper plus minus flexuosus, inferne glaber, medio et superne pilis albis recurvis dense pubescens. *Folia* densa, inferiora deinde marcescentia longe, superiora breviter petiolata, ambitu cordato-orbiculata, in foliis superioribus basi interdum subtruncata, margine ciliata, in utraque pagina et imprimis ad nervos pilis flavidis pubescentia, inferiora profunde 5-partita, superiora 3-partita et segmentis lateralibus bipartitis, segmentis omnibus rhombeo-cuneatis basis versus integerrimis valde attenuatis, profunde laciniatis, laciniis angustis acutis acuminatisve divergentibus, petiolis pubescentibus. *Inflorescentia* terminalis et sæpius axillaris, compacta, *pedunculis* brevibus erectis, *bracteis* foliaceis pedunculos superantibus, *pedicellis* flore brevioribus villosis, *bracteolis* minutis, pubescentibus. *Flores* magni 3 cm. longi, 1·5 cm. lati, intense violacei, pulchri, extus dense et tenuiter pubescentes, *galea* conico-cylindrica, rostro plus minus producto, *sepalis* anterioribus ovalibus latis; *nectaria* recta, apice paulo curvata, glabra; *stamina* numerosa carpello subduplo longiora, filamentis basi dilatatis,

subulatis vel bidentatis, glabris, parte superiore filiformi, pilosa. *Carpella* 4–6, ex toto vel apicem versus plus minus adpresse villosa. *Fructus* non vidi.

Species ab *A. sachalinensi*, Fr. Schmidt, planta magis pubescente, caule flexuoso, inflorescentia densiore, carpellis villosis differt. Ab *A. kamtschatico*, Pall., planta graciliore, floris forma coloreque satis distinguitur.

Hab. Anama, at the mouth of the Poropet; in shady places.

Obs. The poisonous property of the root is said to be not very strong.

*7. Actæa.

*11. A. spicata, *Linn. Sp. Pl.* p. 380; *A. Gray, Bot. Japan*, p. 379; *Huth, in Engl. Bot. Jahrb.* xvi. (1893) p. 308.

Hab. Shakotan; in shady woods.

Obs. My specimen is deflorate and bearing young fruit, so that it is impossible to decide which of the varieties it belongs to.

8. Cimicifuga.

*12. (1.) C. fœtida, *Linn. Syst. Nat.* ed. 12, p. 659.

Var. racemosa, *Regel, Pl. Radd.* p. 121; *Huth, in Bull. Herb. Boiss.* v. (1897) p. 317; *Takeda, in Tôkyô Bot. Mag.* xxiv. (1910) p. 268.

Hab. Anama, Tokkari-Masuba.

Var. intermedia, *Regel, l. c.*; *Huth, l. c.*

Hab. Anama.

13. (2.) C. simplex, *Wormsk.*, var. ramosa, *Maxim. ex Franch. et Sav. Enum. Pl. Jap.* i. p. 13; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 216.

Hab. Shakotan (sec. *Miyabe, l. c.*).

Obs. I have not seen the specimens referred to by Miyabe in his Flora.

*9. Pæonia.

*14. P. obovata, *Maxim. Prim. Fl. Amur.* p. 29; *id. in Mél. Biol.* xii. p. 416; *Makino, in Tôkyô Bot. Mag.* xvi. (1902) p. 59, excl. *β*.

Hab. Shakotan; on more or less exposed hillsides.

2. PAPAVERACEÆ.

10. Corydalis.

15. C. ambigua, *Cham. et Schlecht.*, var. glabra lusus genuina, *Takeda, Beitr.* no. 1.

Hab. Shakotan.

3. CRUCIFERÆ.
(Gen. 6, spp. 8.)

11. (1.) Barbarea.

16 B. orthoceras, *Ledeb. Hort. Dorpat.* 1824, *et Fl. Ross.* i. p. 114; *Maxim. Fl. Prim. Amur.* p. 43; *Fernald, in Rhodora*, 1904, p. 140.

Syn.: *B. vulgaris*, Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 217; Yabe et Yendô, Pl. Shum. p. 182.

Hab. Shakotan; in moist places.

12. (2.) Arabis.

17. (1). A. japonica, *A. Gray, Bot. Japan*, p. 381.

Syn.: *A. Stelleri* var. *japonica*, Fr. Schmidt, Reis. Amurl. Sachal. p. 109; Miyabe, l. c.

Hab. Shakotan, Anama; on sandy beaches.

18. (2.) A. lyrata, *Linn. Sp. Pl.* p. 665; *Miyabe, l. c.*

Hab. Shakotan, Matakotan, mouth of the Poropet; on hillsides or rocky places.

13. (3.) Cardamine.

*19. (1.) C. Impatiens, *Linn. Sp. Pl.* p. 655; *Maxim. in Mél. Biol.* ix. p. 9; *Franch. et Sav. Enum. Pl. Jap.* p. 35.

Hab. Shakotan, mouth of the Poropet; in shady wet places.

*20. (2.) C. flexuosa, *With.*, var. kamtshatica, *Komar. Fl. Mansh.* ii. p. 369.

Syn.: *C. angulata* var. *kamtschatica*, Regel, Pl. Radd. i. p. 172, tab. 2. fig. 1.
C. Regeliana, Miq. Prol. Fl. Japon. p. 5.
C. hirsuta var. *Regeliana*, Maxim. l. c. p. 8; Yabe et Yendô, l. c. p. 183.
C. sylvatica var. *Regeliana*, Kom. l. c.
C. flexuosa subsp. *Regeliana*, O. E. Schultz, in Engl. Bot. Jahrb. xxxii. (1903) p. 476.

Hab. Shakotan; in wet places.

14. (4.) Draba.

21. D. borealis, *DC. Syst. Nat.* ii. p. 342; *Ledeb. Fl. Ross.* i. p. 153; *Miyabe, l. c.* p. 218; *Takeda, Beitr.* no. 48.

Syn.: *D. unalaschkiana*, DC. l. c. p. 350; Ledeb. l. c.
Odontocyclos kurilensis, Turcz. in Bull. Soc. Mosc. 1840, p. 65.

Hab. Shakotan, Anama; on exposed rocky cliffs.

15. (5.) Capsella.

22. C. Bursa-pastoris, *Moench, Meth.* p. 271 ; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 219.

Hab. Shakotan, Anama ; in waste places.

Obs. Probably introduced.

*16. (6.) Isatis.

*23. I. oblongata, *DC. Syst. Nat.* ii. p. 572 ; *Ledeb. Fl. Ross.* i. p. 212 ; *Turcz. Fl. Baic.-Dah.* i. p. 173 ; *Komar. Fl. Mansh.* p. 356.

Hab. Notoro ; along the creek.

4. VIOLARIEÆ.

17. Viola.

*24. (1.) V. Patrinii, *DC.*, var. chinensis, *Ging. in DC. Prodr.* i. p. 293 ; *Maxim. in Mél. Biol.* ix. p. 722.

Hab. Shakotan.

25. (2.) V. Selkirkii, *Pursh* ; *Maxim. l. c.* p. 730 ; *Miyabe, l. c.* p. 219 ; *Makino, in Tôkyô Bot. Mag.* xvi. (1902) p. 130.

Syn. : *V. kamtschatica*, Ging. in Linnæa, i. (1826) p. 406 ; Ledeb. l. c. p. 245 ; Regel, Pl. Radd. i. p. 227, tab. 6. figs. 7–15.

Hab. Shakotan ; in shady forests.

*26. (3.) V. sylvestris, *Kit.*, α. typica, *Maxim. l. c.* p. 743 ; *Yabe et Yendô, Pl. Shum.* p. 187.

Hab. Anama, mouth of the Poropet ; on exposed slopes.

5. CARYOPHYLLEÆ.
(Gen. 8, spp. 13.)

18. (1.) Dianthus.

27. D. superbus, *Linn. Amœn. Acad.* iv. p. 272 ; *Miyabe, l. c.* p. 220.

Hab. Shakotan, Anama, Kiridôshi ; in grassy places.

*19. (2.) Silene.

28. S. repens, *Patr.*, var. latifolia, *Turcz. apud Regel, in Bull. Soc. Nat. Mosc.* 1861, p. 561 ; *Takeda, Beitr.* no. 21.

Hab. Anama ; on grassy slopes near the sea.

*20. (3.) Cucubalus.

*29. C. baccifer, *Linn.*, var. japonicus, *Miq. Prol. Fl. Japon.* p. 142.

Hab. Shakotan.

21. (4.) CERASTIUM.

*30. (1.) C. RIGIDULUM, *Takeda, in Kew Bull.* 1911, p. 105.
Hab. Shakotan; on roadsides.

*31. (2.) C. BOREALE, *Takeda*, var. HERBACEOBRACTEATUM, *Takeda, l. c.*
Syn.: *C. glomeratum*, F. N. Williams, in Bull. Herb. Boiss. vii. (1899) p. 132, *nec* Thuill.
? *C. alpinum* var. *Fischerianum*, Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1910) p. 220.
Hab. Anama; on rocks near the sea.

22. (5.) STELLARIA.

32. (1.) S. MEDIA, *Cyr. Char. Comm.* p. 36; *Maxim. in Mél. Biol.* ix. p. 42; *Miyabe, l. c.* p. 220; *Yabe et Yendô, Pl. Shum.* p. 179.
Hab. Shakotan, Anama, Tokkari-Masuba; in waste places.
Obs. Probably introduced.

33. (2.) S. RUSCIFOLIA, *Willd.*; *Maxim. l. c.* p. 46; *Miyabe, l. c.* p. 221; *Matsudaira, List*, no. 23; *Yabe et Yendô, Pl. Shum.* p. 180.
Hab. Shakotan, Anama, Notoro, Debari; on rocky cliffs.

34. (3.) S. LONGIFOLIA, *Muehl. in Willd. Enum. Berol.* p. 679; *Maxim. l. c.* p. 48; *Miyabe, l. c.* p. 221.
Hab. Mouth of the Poropet; in grassy fields.

35. (4.) S. SACHALINENSIS, *Takeda, Beitr.* no. 49.
Syn.: *S. borealis* var. *corollina* lusus *sachalinense*, Regel, in Ind. Sem. Hort. Petrop. 1863, p. 33.
S. borealis var. *corollina*, Maxim. Prim. Fl. Amur. p. 159, *nec* Fenzl; Fr. Schmidt, Reis. Amur. Sachal. p. 117.
S. yezoensis, Maxim. Mél. Biol. xii. (1866) p. 419; Miyabe, l. c. p. 221; Yabe et Yendô, l. c. p. 180; Yatabe, Iconogr. Fl. Japon. i. 3, sub tab. xli.
S. pilosula, Franch. in Bull. Soc. Philom. Paris, sér. VII, xii. (1888) p. 84.
Hab. Shakotan; in woods.

*36. (5.) S. HUMIFUSA, *Rottb.*, α. OBLONGIFOLIA, *Fenzl, in Ledeb. Fl. Ross.* i. p. 384.
Hab. Mouth of the Poropet; in muddy estuaries.

23. (6.) Ammodenia.

37. A. peploides, *Rupr.*, var. oblongifolia, *Maxim. in Mél. Biol.* xii. p. 34.
Syn.: *Honkeneya peploides* var. *oblongifolia*, Fenzl, in Ledeb. Fl. Ross. i. p. 357.
Arenaria peploides var. *oblongifolia*, S. Watson; Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 221.
Hab. Shakotan, Anama; on the beach, common.

*24. (7.) Mœhringia.

*38. M. lateriflora, *Fenzl, in Ledeb. Fl. Ross.* i. p. 371; *Maxim. l. c.* p. 35; *Yabe et Yendô, Pl. Shum.* p. 180.
Syn.: *Arenaria lateriflora*, Linn. Sp. Pl. p. 423.
Hab. Shakotan, Anama.

*25. (8.) Sagina.

*39. S. saginoides, *Dalla Torre, Anleit. Beob. Alpenfl.* p. 189 (1882); *Britt. & A. Br. Ill. Fl. N. Am.* ii. (1894) p. 30.
Syn.: *S. Linnæi*, Presl, Rel. Haenck. ii. p. 14 (1831); Maxim. l. c. ix. p. 32; Yabe et Yendô, l. c. p. 180.
Hab. Anama.

6. HYPERICINEÆ.

26. Hypericum.

40. H. erectum, *Thunb. Fl. Japon.* p. 296; *Maxim. l. c.* xi. p. 168; *Miyabe, l. c.* p. 222.
Syn.: *H. attenuatum*, Fr. Schmidt, Reis. Amurl. Sachal. p. 119, *nec* Choisy. *teste* Maxim. l. c.
Hab. Matakotan, Anama; in exposed, grassy, and more or less moist places.
Obs. Specimina nostra *caule* obscure lineato, foliis minus amplexicaulibus *H. attenuato* quoad staturam accedunt, sed ob folia prorsus nigro-punctata, sepala lanceolato-oblonga, obtusa, petalaque punctata lineataque, stamina petala breviora distinguuntur. Forma similis occurit in Yezo.

*7. TERNSTRŒMIACEÆ.

*27. Actinidia.

*41. A. Kolomicta, *Maxim. Prim. Fl. Amur.* p. 63; *Fr. Schmidt, l. c.* p. 118; *Dunn, in Journ. Linn. Soc., Bot.* xxxix. (1911) p. 404.
Hab. Shakotan, Anama; in woods.

8. GERANIACEÆ.

28. (1.) Geranium.

42. (1.) G. yezoense, *Franch. et Sav. Enum. Pl. Jap.* ii. p. 305 ; *Maxim. in Mél. Biol.* x. p. 625, pro parte ; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 222.
Hab. Anama ; in grassy places near the sea.

43. (2.) G. eriantnum, *DC. Prodr.* i. p. 641 ; *Maxim. l. c.* p. 631.
Hab. Shakotan, between Shakotan and Chipoi, Anama ; in grassy places.

29. (2.) Oxalis.

44. O. Acetosella, *Linn. Sp. Pl.* p. 433 ; *Miyabe, l. c.* p. 222 ; *Makino, n Tôkyô Bot. Mag.* xxii. (1908) p. 170.
Hab. Near Shakotan ; in woods.

30. (3.) Impatiens.

45. I. Noli-tangere, *Linn. l. c.* p. 938 ; *Miyabe, l. c.*
Hab. Anama ; in shady places.

9. RUTACEÆ.

*31. Phellodendron.

*46. P. amurense, *Rupr. apud Maack, in Bull. Phys.-Math. Acad. Sc. St. Pétersb.* xv. p. 526 ; *Maxim. Prim. Fl. Amur.* p. 72 ; *Sargent, Trees and Shrubs*, i. p. 197, tab. 93.
Syn. : *Fraxinus Sieboldiana*, Matsudaira, List, no. 54, *nec* Blume.
Hab. Shakotan.

10. ILICINEÆ.

32. Ilex.

47. I. crenata, *Thunb. Fl. Japon.* p. 78 ; *Maxim. in Mém. Acad. Imp. Sc. St. Pétersb.* xxix. 3, pp. 21, 23 ; *Miyabe, l. c.* p. 223.
Hab. Shakotan, swamp of Poropet ; in boggy places.

*11. AMPELIDEÆ.

*33. Vitis.

*48. V. Coignetiæ, *Pulliat apud Planch. Monogr. in DC. Monogr. Phanerogam.* v. 2, p. 325.
Hab. Shakotan, Anama, and several other places ; common.

12. ACERACEÆ.

34. ACER.

49. A. PICTUM, *Thunb.*, var. MONO, *Maxim. in Mél. Biol.* x. p. 600; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 223.

Syn.: *A. Mono,* Maxim. Prim. Fl. Amur. p. 68.

Hab. Shakotan, between Matakotan and Anama, etc.

Obs. My specimens agree very well with the original specimens of *A. Mono* from Amur, collected by Maximowicz. *A. pictum* possesses a strong tendency to variation with regard to hairiness and shape of the leaf, as well as of the fruit. In the neighbourhood of Satporo, Yezo, where various forms of this species are growing wild, a field botanist would be surprised at the striking features exhibited by them. Towards the end of April or at the beginning of May, when the fresh leaves are unfolding, the foliage of some trees is greenish-yellow in colour, and of others reddish-yellow. The leaf of the tree with foliage of the former colour is usually cordate at the base, and the trunk has dark coloured bark. The other form has leaves somewhat truncate at the base, and whitish bark. So far as I have observed, the male flower of the yellowish-leaved form is larger than that of the other, having stamens as long as the sepals, whilst in the reddish-leaved form the stamens are shorter than the sepals. A closely allied species, or possibly a subspecies, *A. Mayrii,* Takeda, Beitr. no. 95, comes nearer to the reddish-leaved form so far as the leaf and bark are concerned, but resembles the other form in floral structure. A careful comparative study of all the members of this group would be interesting, and is much desired.

13. ANACARDIACEÆ.

35. RHUS.

50. R. TOXICODENDRON, *Linn.*, var. RADICANS, *Torr. Fl. U. S.* p. 224; *Franch. et Sav. Enum. Pl. Jap.* i. p. 93; *Miyabe, l. c.* p. 224.

Hab. Shakotan; in woods.

14. LEGUMINOSÆ.
(Gen. 8, spp. 10.)

36. (1.) THERMOPSIS.

51. T. FABACEA, *DC. Prodr.* ii. p. 99; *Miyabe, l. c.* p. 224.

Hab. Shakotan, Anama; on the shore.

Obs. The specimens referred to in Hemsl. Index Fl. Sinensis, are not this species, but *T. chinensis,* Benth.

37. (2.) Trifolium.

52. (1.) T. Lupinaster, *Linn. Sp. Pl.* p. 766 ; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 224.

Hab. Shakotan, Anama.

*53. (2.) T. repens, *Linn. l. c.* p. 767; *Franch. et Sav. Enum. Pl. Jap.* i. p. 96.

Hab. Shakotan ; in waste places.

Obs. The plant was originally imported into Japan for cultivation and has spread over the country. It has also found its way to Shikotan, probably from Yezo, where the plant is met with abundantly in the meadows.

38. (3.) Oxytropis.

*54. O. retusa, *Matsumura, in Tôkyô Bot. Mag.* xv. (1901) p. 116 ; xvi. p. 66.

Legumen oblongo-ovatum, 2 cm. longum, 1 cm. latum, calycem superans, sessile, apicem versus in stylum longum glabrum attenuatum, pilis albis et nigris brevibus pubescens, uniloculare, sutura dorsali anguste-septigera ; *semina* circa 12.

Hab. Shakotan-yama, Anama, mouth of the Poropet ; in grassy slopes.

*39. (4.) Hedysarum.

*55. H. obscurum, *Linn.*, var. neglectum, *Trautv. in Bull. Soc. Nat. Mosc.* xxxiii. (1860) ii. p. 516 ; *Boissieu, in Bull. Herb. Boiss.* vi. (1898) p. 667 ; *Matsumura, l. c.* p. 68 ; *Yabe et Yendô, Pl. Shum.* p. 187.

Syn. : *H. neglectum*, Ledeb. Fl. Alt. iii. p. 340 ; Fl. Ross. i. p. 705 ; Icon. Pl. Fl. Ross. Illustr. v. tab. 482.

Hab. Shakotan, Anama, the mouth of the Poropet ; on rocks near the sea.

Obs. The plant is rather variable in growth according to the circumstances of its habitat. The leaf is hairy beneath, the standard shorter than the keel, and each jointed portion of the pod is roundish or oblong-round, chartaceous and pubescent.

*40. (5.) Lespedeza.

*56. L. bicolor, *Turcz.*, α. typicum, *Maxim. Synops.* p. 30.

Hab. Anama.

41. (6.) Vicia.

57. V. Cracca, *Linn.*, var. canescens, *Maxim. Prim. Fl. Amur.* p. 82 ; *Miyabe, l. c.* p. 225.

Hab. Matakotan, Anama.

42. (7.) LATHYRUS.

58. (1.) L. MARITIMUS, *Bigel. Fl. Bost.* ed. 2, p. 268; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 225.

Hab. Shakotan, Anama, mouth of the Poropet; on beaches.

59. (2.) L. PALUSTRIS, *Linn.*, var. PILOSUS, *Ledeb. Fl. Ross.* i. p. 686; *Maxim. in Mél. Biol.* ix. p. 61; *Miyabe, l. c.*

Hab. Matakotan, Anama; in boggy places.

Obs. Nostra specimina notabilia *caule* tenui 1–2-pedali anguste alato, *pedunculis* 3-floris folium superantibus, *foliis* 2–3-jugis, foliolis oblongo-linearibus sensim attenuatis mucronatis utraque pagina pilosis, *stipulis* semi-sagittatis angustis utrinque acuminatis.

*43. (8.) MAACKIA.

*60. M. AMURENSIS, *Rupr. et Maxim.*, var. BUERGERI, *C. K. Schneid. Illustr. Handb. Laubh.* ii. p. 16, excl. syn.; *Takeda, in Notes Roy. Bot. Gard. Edinb.* viii. (1913) p. 100, tab. 27. figs. 28–38.

Syn.: *Cladrastis amurensis* var. *Buergeri*, Maxim. in Bull. Acad. Sc. St. Pétersb. xviii. (1873) p. 400, excl. syn.
C. amurensis var. *floribunda*, Maxim. apud Franch. et Sav. Enum. Pl. Jap. i. p. 113, excl. syn.
C. amurensis var. *Vidalii*, Franch. et Sav. l. c. ii. p. 327.

Hab. ins. Shikotan.

Obs. I have not seen any specimen of this plant from this island, but add it on the authority of the settlers of the island.

15. ROSACEÆ.

(Gen. 13, spp. 22.)

44. (1.) PRUNUS.

61. (1.) P. MAXIMOWICZII, *Rupr. in Bull. Acad. Sc. St. Pétersb.* xv. (1856) p. 131; *Miyabe, l. c.* p. 226.

Hab. Near Notoro (according to the inhabitants).

62. (2.) P. SSIORI, *Fr. Schmidt, Reis. Amurl. Sachal.* p. 124; *Miyabe, l. c.*

Hab. Various places in woods (according to the inhabitants).

45. (2.) ARUNCUS.

63. A. SYLVESTER, *Kostel.* var. KAMTSCHATICA, *Maxim. in Act. Hort. Petr.* vi. (1879) p. 170; *Miyabe, l. c.* p. 227.

Hab. Shakotan, Anama.

46. (3.) Spiræa.

*64. (1.) S. media, *Fr. Schmidt*, var. sericea, *Maxim. in Act. Hort. Petrop.* vi. (1879) p. 189 ; *C. K. Schneid. in Bull. Herb. Boiss.* Ser. 2, v. (1905) p. 340.

Syn. : *S. sericea*, Turcz. Fl. Baic.-Dah. i. p. 358.
S. confusa var. *sericea*, Regel, Tentam. Fl. Ussur. p. 53.

Hab. Shakotan, between Shakotan and Chipoi ; in shady places.

65. (2.) S. betulifolia, *Pall. Fl. Ross.* i. p. 33, tab. 16 ; *Maxim. l. c.* p. 208 ; *C. K. Schneid. l. c.* p. 348 (α. typica) ; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 227.

Hab. In the neighbourhood of Shikotan, Anama ; in more or less boggy places.

*66. (3.) S. salicifolia, *Linn.*, var. lanceolata, *Torr. et Gray, Fl. N. Am.* i. p. 415 ; *Maxim. l. c.* p. 210.

Hab. Shakotan, between Shakotan and Chipoi, between Matakotan and Anama, Anama ; in boggy places.

47. (4.) Sorbaria.

67. S. sorbifolia, *A. Br.*, var. stellipila, *Maxim. l. c.* p. 223.

Hab. Shakotan.

48. (5.) Filipendula.

68. F. kamtschatica, *Maxim. l. c.* p. 248 ; *Miyabe, l. c.* p. 228 ; *Koidzumi, in Tôkyô Bot. Mag.* xxiii. (1909) p. 179.

Syn. : *Spiræa camtschatica*, Pall. Fl. Ross. i. p. 41, tab. 28 ; Matsudaira, List, no. 34.
Ulmaria kamtschatica, Matsumura, Shokubutsu-Meii, no. 3206 ; Yabe et Yendô, l. c. p. 186.

Hab. In the neighbourhood of Shakotan, Shakotan-yama, Anama.

49. (6.) Rubus.

69. R. Idæus, *Linn.*, var. aculeatissimus, *Regel et Til. Fl. Ajan.* p. 87 (1857) ; *Fr. Schmidt, Reis. Amurl. Sachal. l. c.* p. 128.

Syn. : *R. aculeatissimus*, C. A. Mey. ined.
R. Idæus var. *strigosus*, Miyabe, l. c. p. 228.
R. sachalinensis, Léveillé, in Fedde, Repert. vi. p. 332.
R. Idæus subsp. *sachalinensis*, Focke, Monogr. p. 210.

Hab. Shakotan, Anama.

Obs. This plant is fairly widely distributed in the Far East. The present form comes near to the N. American var. *strigosus*. It is, however, distinguished from the latter by the nature of the prickles, which are very dense

and do not bear glands on the tips. The glandular hairs also occur copiously intermixed with the prickles. There is no room for doubt that this form has a closer relationship to *R. phoenicolasius*, from which our plant is distinguished by having paler-coloured prickles and spreading or reflexed calyx-segments. The leaf is usually trifoliate, 5-foliolate leaves occurring but seldom in this form.

In Hontô another form of the same species, known as var. *nipponicus*, is not uncommon. Palibin mentions the occurrence of this form in Corea (Consp. Fl. Cor. i. p. 78). Although I have not been able to examine the specimen from Seoul, which is referred to by this author, the other one collected by Sontag at Van-Tang-San is not identical with *Rubus Idæus* var. *nipponicus*, Focke, but is, in fact, *R. triphyllus*, Thunb., which is known from Corea under the name of *R. parviflorus* in Palibin's book.

50. (7.) Geum.

70. (1.) G. strictum, *Ait. Hort. Kew.* ed. 1, ii. p. 217; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 229.

Hab. Shakotan.

*71. (2.) G. calthifolium, *Sm.*, var. dilatatum, *Torr. et Gray, Fl. N. Am.* i. p. 425; *Franch. et Sav. Enum. Pl. Jap.* ii. p. 335; *Yabe et Yendô, Pl. Shum.* p. 185.

Hab. Shakotan-yama.

*51. (8.) Fragaria.

*72. F. neglecta, *Lindem. in Bull. Soc. Nat. Mosc.* xxxviii. (1865) 2 p. 220; *Takeda, Beitr.* no. 62.

Hab. Shakotan, Anama, Debari; in grassy places.

52. (9.) Potentilla.

73. (1.) P. fruticosa, *Linn.*, var. tenuifolia, *Lehm. Rev. Pot.* p. 17; *Th. Wolf, Monogr.* p. 58.

Hab. Shakotan, Shakotan-yama, Anama, mouth of the Poropet, between Shakotan and Chipoi, Debari, Kiridôshi; in grassy hillsides and on rocks, common.

74. (2.) P. fragarioides, *Linn.*, var. stolonifera, *Maxim.* forma japonica, *Th. Wolf, l. c.* p. 639.

Hab. Shakotan, Anama.

75. (3.) P. Anserina, *Linn. Sp. Pl.* p. 495; *Th. Wolf, l. c.* p. 669.

Hab. Shakotan, Anama; in moist places.

76. (4.) P. MEGALANTHA, *Takeda, in Kew Bull.* (1911) p. 225, cum fig.

Syn.: *P. fragiformis*, Fr. Schmidt, Reis. Amurl. Sachal. p. 127, *non* Willd; Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 231, *nec* Willd.; Matsudaira, List, no. 36, *nec* Willd.; Yabe et Yendô, Pl. Shum. *nec* Willd. p. 185.

P. grandiflora, Maxim. in Act. Hort. Petrop. vi. (1879) p. 161, *pro parte.*

Hab. Anama.

53. (10.) AGRIMONIA.

77. A. PILOSA, *Ledeb. Ind. Sem. Hort. Dorpat. Suppl.* 1823, p. 1; *Fl. Alt.* ii. p. 205; *Fl. Ross.* ii. p. 32; *Fr. Schmidt, l. c.* p. 127.

Syn.: *A. Eupatoria*, Thunb. Fl. Japon. p. 195, nec non autor. plur. quoad pl. Japon. et Chinens.

Hab. Shakotan, Anama.

Obs. I quite agree with Komarov's view in regarding the species of *Agrimonia* occurring in the Far East as *A. pilosa.* This species is rather variable in regard to its growth and hairiness. A stout and villous form, which may be *A. viscidula*, Bunge, is often taken for *A. Eupatoria.* There occur various intermediate forms connecting the extremes of these two. The setaceous appendages on the calyx-tube of the fruit are all erect in our plants, which affords a good distinguishing character of *A. pilosa* from the true *A. Eupatoria.*

54. (11.) SANGUISORBA.

78. S. TENUIFOLIA, *Fisch.*, α. ALBA, *Trautv. et Mey. Fl. Ochot.* p. 35; *Maxim. in Bull. Acad. Sc. St. Pétersb.* xix. p. 161; *Miyabe, l. c.* p. 232.

Syn.: *S. tenuifolia*, Turcz. Fl. Baic.-Dah. i. p. 404.

S. tenuifolia, β. *grandiflora*, Maxim. Prim. Fl. Amur. p. 94.

S. jezoensis, Sieb. ex Miq. Prol. Fl. Japon. p. 372.

Hab. Shakotan, between Shakotan and Chipoi, Anama; in grassy places.

Obs. My specimens agree with those of Turczaninow and of Maximowicz above referred to. Maximowicz's var. *parviflora*, ll. cc., should be separated as a distinct species, *S. parviflora* (Maxim.), Takeda, on account of its long, narrow, and nutant spike, smaller flowers, and broad filament.

55. (12.) ROSA.

79. (1.) R. ACICULARIS, *Lindl.*, β. GMELINI, *C. A. Mey. Zimmtrosen*, p. 17; *Regel, in Act. Hort. Petrop.* v. (1877) p. 302; *Miyabe, l. c.* p. 232.

Hab. Shakotan.

80. (2.) R. RUGOSA, *Thunb. Fl. Japon.* p. 213; *Regel, in Act. Hort. Petrop.* v. (1877) p. 308; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 232.

Syn.: *R. kamtschatica*, Redouté, Ros. i. p. 47.

Hab. Shakotan, Anama, Hamanasu-wan, etc.; common near the sea.

56. (13.) SORBUS.

81. (1.) S. SAMBUCIFOLIA, *M. Roemer, Syn. Monogr. Rosifl.* iii. p. 139; *Maxim. in Mél. Biol.* ix. p. 172; *C. K. Schneid. Ill. Handb. Laubh.* i. p. 667.

Syn.: *Pyrus sambucifolia*, Cham. et Schlecht. in Linnæa, iii. (1828) p. 36; Miyabe, l. c.

Hab. Shakotan, Anama, Debari.

*82. (2.) S. COMMIXTA, *Hedl. Monogr.* p. 38; *C. K. Schneid. l. c.* p. 677, excl. β.; *Takeda et Nakai, in Tôkyô Bot. Mag.* xxiii. (1910) p. 51.

Syn.: *S. Aucuparia* var. *japonica*, Maxim. l. c. p. 170, excl. syn. *S. discolor*.

S. japonica, Koehne, in Gartenfl. 1901, p. 408, *non* Sieb.

Pyrus Aucuparia var. *japonica*, Maxim. in litt. ex Franch. et Sav. Enum. Pl. Jap. i. p. 140.

P. americana var. *microcarpa*, Miq. Prol. Fl. Japon. p. 229, *non* Torr. et Gray.

Hab. Anama.

16. SAXIFRAGACEÆ.

(Gen. 4, spp. 8.)

57. (1.) SAXIFRAGA.

*83. (1.) S. CORTUSIFOLIA, *Sieb. et Zucc. Fl. Japon. Fam. Nat.* no. 364; *Takeda, in Journ. Bot.* xlix. (1911) p. 110.

Hab. Anama, mouth of the Poropet; on rocks.

84. (2.) S. FUSCA, *Maxim. l. c.* viii. p. 602; *Takeda, l. c.* p. 111.

Hab. In woods along the Ontanipet.

Obs. Although I have not been able to see the inflorescence of any specimens from our island, I rather presume our plant belongs to var. *divaricata*, Franch. et Sav.

85. (3.) S. REFLEXA, *Hook. Fl. Bor.-Am.* i. p. 249, tab. 85; *Miyabe, l. c.* p. 233, excl. syn.; *Takeda, l. c.* p. 113.

Syn.: *S. sachalinensis*, Fr. Schmidt, Reis. Amurl. Sachal. p. 133.

Syn.: *S. virginiensis*, var. *yezoensis*, Franch. in Bull. Soc. Philom. Paris (April 1888), p. 4.

Hab. Shakotan, Anama, mouth of the Poropet, Notoro; common on moist rocks.

86. (4.) S. BRONCHIALIS, *Linn.*, var. CHERLERIOIDES, *Engl. Monogr.* p. 216; *Takeda, in Journ. Bot.* xlix. (1911) p. 112.

Syn.: *S. cherlerioides*, D. Don, in Trans. Linn. Soc. xiii. (1822) p. 382 (*fide* spec. orig.).

S. bronchialis, Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 233.

S. bronchialis, *β. minor*, Hook. et Arn. in Beechey's Voy. p. 114.

S. bronchialis var. *pseudo-burseriana*, Fr. Schmidt, Reis. Amurl. Sachal. p. 133.

Hab. Shakotan, Anama, Notoro, Debari; on rocks near the sea.

58. (2.) PARNASSIA.

87. P. PALUSTRIS, *Linn. Sp. Pl.* p. 273; *Miyabe, l. c.* p. 234.

Hab. Between Shakotan et Chipoi, Anama, Kiridôshi.

59. (3.) HYDRANGEA.

*88. (1.) H. PANICULATA, *Sieb. Syn. Hydr. in Act. Leop.-Carol.* xiv. 2, p. 691; *Sieb. et Zucc. Fl. Japon.* i. p. 115, tab. 51; *Maxim. Rev. Hydr.* p. 9; *Matsudaira, List*, no. 32; *Rehd. in Sargent, Pl. Wilsonianæ*, i. p. 25.

Hab. Shakotan.

89. (2.) H. PETIOLARIS, *Sieb. et Zucc. l. c.* p. 108, tab. 54; *Rehd. l. c.* p. 36.

Syn.: *H. scandens*, Maxim. in Mél. Biol. viii. p. 16, *non* DC. *nec* Pœppig; Miyabe, l. c. p. 234.

H. cordifolia, Sieb. et Zucc. l. c. p. 113, tab. 59. fig. 2.

H. bracteata, Sieb. et Zucc. l. c. p. 176, tab. 92.

Hab. In woods along the Ontanipet.

60. (4.) RIBES.

*90. R. LATIFOLIUM, *Jancz. Monogr.* p. 294.

Syn.: *R. petræum* var. *tomentosum*, Maxim. Prim. Fl. Amur. p. 118; id. in Mél. Biol. ix. p. 231.

Hab. Anama, in woods along the Ontanipet.

17. CRASSULACEÆ.

61. SEDUM.

91. (1.) S. RHODIOLA, *DC.*, *α.* VULGARE, *Maxim. in Mél. Biol.* xi. p. 734.

Hab. Shakotan, Anama, Notoro, Debari; on rocky cliffs near the sea.

92. (2.) S. KAMTSCHATICUM, *Fisch. in Ind. Sem. Hort. Petrop.* vii. p. 54 ; *Maxim. in Mél. Biol.* xi. p. 759.

Hab. Shakotan, Anama, Shakotan-yama, mouth of the Poropet, Notoro, Debari ; common on rocky cliffs.

*18. DROSERACEÆ.

*62. DROSERA.

*93. D. ROTUNDIFOLIA, *Linn. Sp. Pl.* p. 281 ; *Diels in Engl. Pflanzenr.* Heft 26, p. 93.

Hab. Between Shakotan and Chipoi ; in Sphagnum bogs.

*19. LYTHRARIEÆ.

*63. LYTHRUM.

*94. L. SALICARIA, *Linn.*, γ. VULGARE, *Kœhne in Engl. Pflanzenr.* Heft 17, p. 77.

Hab. Anama.

20. ONAGRARIEÆ.
(Gen. 2, spp. 6.)

64. (1.) EPILOBIUM.

*95. (1.) E. PALUSTRE, *Linn. Sp. Pl.* p. 348; *Hausskn. Monogr.* p. 128 ; *Yabe et Yendô, Pl. Shum.* p. 188; *Nakai, in Tôkyô Bot. Mag.* xxii. (1908) p. 82.

Syn. : *E. dahuricum,* Nakai, l. c. p. 83, *non* Fisch.

Hab. Anama ; on wet rocks near the sea.

Obs. Our specimens belong to forma *albiflora*, and represent f. *major* and *minor* of Haussknecht.

*96. (2.) E. LINEARE, *Muehl. Cat.* p. 39 ; *Hausskn. l. c.* p. 255 ; *Trel. in Miss. Bot. Gard.* ii. (1891) p. 87.

Hab. Near Shakotan, between Shakotan and Chipoi ; in boggy places.

*97. (3.) E. GLANDULOSUM, *Lehm. Pug.* ii. (1830) p. 14 ; *Hausskn. l. c.* p. 273 ; *Trel. l. c.* p. 99, tab. 29 ; *Léveillé, in Bull. Soc. Bot. Fr.* liv. (1907) p. 522.

Caules solitarii, robusti, semper erecti, pedales vel ultra bipedales, simplices vel superne ramosi, erubescentes, lineis elevatis pilosis inferne glabrescentibus decurrentibus notati, inferne glabrescentes, superne hirtelli. *Folia* remota, opposita, sessilia, oblongo-lanceolata, basi ovata, subamplexicaulia, obtusa, calloso-denticulata, dentibus approximatis, nervis prominentibus, in mediis plus minus pilosula, margine pilosa, ceterum glabra,

herbacea. *Bracteæ* alternatæ, ovato-lanceolatæ, glabrescentes. *Racemus* multiflorus. *Flores* pedicellis abbreviatis, parvi, fere 6 mm. longi, erecti. *Petala* rosea, cuneato-obcordata, bifida, calyce albo-piloso sesquilongiora. *Stigma* clavatum, apice emarginatum. *Capsula* breviter pedicellata, pedicello vix 1 cm. longo, piloso, 6 cm. longa, dense hirta. *Semina* fusiformia, utrinque attenuata, apice brevissime appendiculata, basi acuta, 1·25 mm. longa, tenuissime papillosa ; *coma* alba, semina sua 4-plo longiora.

Hab. Tokkari-Masuba ; in wet places.

*98. (4) E. SHIKOTANENSE, *Takeda*, sp. nov.

Caules solitarii, tenues, virgati, erecti, pedales et ultra, simplices, internodiis remotis, lineis elevatis pilosis decurrentibus notati, ceterum glabri. *Folia* inferiora et media opposita, superiora alternata, sessilia, late lanceolata, obtusiuscula, calloso-denticulata, dentibus approximatis, supra pilosula, subtus in nervis pilosa, margine adpresse piloso-ciliata. *Bracteæ* alternatæ, lanceolatæ, acutæ, argute denticulatæ, pedicello parce glanduloso-pilosulo paulo superantes, glabrescentes. *Racemus* pauci-(6–8)-florus. *Flores* breviter pedicellati, parvi, 6 mm. longi, erecti. *Petalis* pallide rosea, obcordata, leviter bifida, calyce glanduloso-pilosulo sesquilongiora. *Stigma* clavatum in stylum sensim attenuatum, leviter emarginatum. *Capsula* pedicello 1·5 cm. longo suffulta, 4 cm. longa, glanduloso-pilosula. *Semina* fusiformia, utrinque attenuata, minutissime papillosa, *coma* alba.

E. adenocaulo ? var. *perplexanti* (Trel. Cat. Miss. Bot. Gard. ii. p. 96) simile, a quo capsula sparse glandulosa nec pilis crispulis vestita, foliis in nervis pilosis nec glabris, caule non glanduloso dignoscitur.

Hab. Tokkari-Masuba ; in wet places, growing with the preceding.

*99. (5.) E. OVALE, *Takeda*, sp. nov.

Caules solitarii e radice erecti vel plus minus arcuato-adscendentes, simplices vel superne pauciramosi, rarius a basi ad apicem subramosi, 20–30 cm. alti, teretiusculi, prorsus glabri, lineis pilis albis crispulis glandulosis prominentibus notati, internodiis plus minus distantibus. *Stolones* hypogæi, pauci, breves. *Folia* caulina omnia opposita, subsessilia, dilatata, ovalia, vel anguste ovalia, obtusa, calloso-denticulata, membranaceo-herbacea, levia, tantum in nervis conspicuis pilosula, margine pilis crispulis ciliata. *Bracteæ* alternatæ, ovatæ, acutiusculæ, calloso-denticulatæ, glabræ, ad nervos pilosulæ, margine ciliatæ. *Flores* 3–5, breviter pedicellati, fere 8 mm. longi, virginei vix nutantes. *Petala* rosea, rotundato-obcordata, leviter bifida, calyce sæpe erubescentia sparse glanduloso-pilosuloque 1–3 plo longioribus. *Stigma* clavato-suburceolatum, bilobum, lobis iterum emarginatis. *Capsula* juvenilis erecta, 3 cm. longa, leviter glanduloso-puberula, pedicellis bractea

valde brevioribus, pilis reversis tenuiter pubescentibus. *Semina* mihi ignota.

Species *E. Behringiano*, Hausskn., quod mihi ex descriptione notum est, proxima esse videtur, sed ab eo stigmate capitato-clavato nec anguste clavato, pedicellis pilosis nec glanduloso pilosiusculis, foliis herbaceo-membranaceis, nec rigidis subglaucescentibusque, caulibus solitariis nec cæspitosis differt.

Hab. Anama ; in wet places near the sea.

65. (2.) CIRCÆA.

100. C. ALPINA, *Linn. Sp. Pl.* p. 9 ; *Miyabe, Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 235.

Hab. Shakotan ; in woods.

21. UMBELLIFERÆ.
(Gen. 11, spp. 12.)

*66. (1.) BUPLEURUM.

*101. (1.) B. LONGIFOLIUM, *Linn.*, var. AUREUM, *H. Wolff*, subvar. BREVI-INVOLUCRATUM, *H. Wolff, in Engl. Pflanzenr.* Heft 43, p. 53.

Syn. : *B. aureum*, Takeda, Beitr. no. 31.

Hab. Summit of Shakotan-yama, Anama ; in grassy slopes.

Obs. Our specimens are rather depauperate, with narrow foliage-leaves and narrow involucral leaves. In herbarium specimens it is sometimes not easy to distinguish this species from stunted forms of *B. longeradiatum* var. *breviradiatum*.

*102. (2.) B. LONGERADIATUM, *Turcz.*, var. BREVIRADIATUM, *Fr. Schmidt in Maxim. Prim. Fl. Amur.* p. 125 ; *H. Wolff, l. c.* p. 55.

Syn. : *B. sachalinense*, Fr. Schmidt, Reis. Amurl. Sachal., p. 135 ; Yabe, Umbellifer. Japon. p. 32, tab. 1. fig. 11.

Hab. Shakotan (*teste* Yabe, Pl. Shum.).

67. (2.) ÆGOPODIUM.

103. Æ. ALPESTRE, *Ledeb. Fl. Alt.* i. p. 354 ; *Fl. Ross.* ii. p. 248 ; *Yabe, l. c.* p. 44.

Hab. Shakotan, Shakotan-yama, between Shakotan and Chipoi, near Matsugahama ; in moist shady places.

*68. (3.) SESELI.

*104. S. LIBANOTIS, *Koch, Gen. Trib. Umbellif.* p. 111 ; *Yabe, l. c.* p. 58.

Var. KURILENSIS, *Takeda*, var. nov.

Caulis humilis ca. 30 cm. altus, flexuosus, stramineus, sulcatus, glaber, ad

nodos papillosus. *Folia* ambitu ovata vel deltoidea, bipinnatisecta, segmentis latis cuneato-ovatis pinnatifido-incisis, pinnis I. ordinis remote dispositis petiolulatis, glabra, supra læte viridia, ad costas puberula, infra pallidiora, radicalia longe (5–6 cm.) petiolata, petiolo laminam æquante basi vaginato, caulina brevius petiolata, petiolo longe vaginato, suprema diminuta sed non aphylla. *Umbella* involucrata, involucri phyllis 2–5 angustissimis integris extus plus minus hirtellis, multiradiata, radiis 15–20, 1·5–3·5 cm. longis intus puberulis, umbellulis multifloris, involucelli phyllis ad 10 linearibus pedicello adæquilongis. *Calycis dentes* minuti, edenticulati. *Petala* alba, late obovata, inflexo-acuminata. *Stamina* filamentis petalo sesquilongioribus, apice curvatis, antheris albis. *Ovarium* plus minus puberulum, stylis $\frac{2}{3}$ longis. *Fructus* non vidi.

Hab. Anama ; on grassy slopes.

*69. (4.) Phellopteris.

105. P. littoralis, *Benth. in Benth. et Hook. fil. Gen. Pl.* i. p. 905 ; *Yabe, Umbellifer. Japon.* p. 93.

Hab. Shakotan, Matsugahama ; on sandy beaches, not common.

70. (5.) Ligusticum.

106. L. scoticum, *Linn. Sp. Pl.* p. 250 ; *Yabe, Pl. Shum.* p. 64.

Hab. Shakotan, Anama, Tokkari-Masuba ; on rocks near the sea.

*71. (6.) Conioselinum.

*107. C. kamtschaticum, *Rupr. Rev. Umbell. Kamtschat. in Beitr. Pflanzenk. Russ. Reichs*, xi. p. 22 ; *Takeda, Beitr.* no. 67.

Hab. Shakotan, Anama, Debari ; on rocks near the sea.

*72. (7.) Cnidium.

*108. C. ajanense, *Drude, in Engl. u. Prantl, Nat. Pflanzenfam.* iii. 8, p. 210 ; *Yabe, l. c.* p. 62.

Syn. : *Tilingia ajanensis*, Regel in Regel et Til. Fl. Ajan. p. 132.
C. Tilingia, Takeda, in Tôkyô Bot. Mag. xx. p. 305.

Hab. Shakotan, Anama.

Obs. Maximowicz was the first to report the occurrence of this plant in Japan (Mél. Biol. xii. p. 469); but his specimen in the Kew Herbarium is quite different from the true species. Absence of fruit makes it, however, difficult to determine this specimen with accuracy. The character of the leaf and a cross section of the ovary suggest to me that it may be a form of *Seseli Libanotis*.

73. (8.) Pleurospermum.

109. P. austriacum, *Hoffm. Umbellif.* p. viii ; *Yabe, Umbellifer. Japon.* p. 29.
Syn. : *P. kamtschaticum*, Hoffm. l. c. p. x.
Hab. Shakotan, Shakotan-yama, mouth of the Poropet ; in grassy places.

74. (9.) Angelica.

*110. A. reflecta, *Fr. Schmidt, Reis. Amurl. Sachal.* p. 138 ; *Yabe, l. c.* p. 76.
Hab. Tokkari-Masuba.

75. (10.) Cœlopleurum.

111. C. Gmelini, *Ledeb. Fl. Ross.* ii. p. 361 ; *Yabe, l. c.* p. 69.
Hab. Anama, mouth of the Poropet ; in grassy places.
Obs. Specimina nostra *caule* ad sesquipedale, *foliis* cum petiolo 10–15 cm. longis, *umbellis* infra 10 cm. diametro, radiis 2–4 cm. longis notabilia. Probabiliter ad formam *tenuam*, Fr. Schmidt (l. c. p. 136) referenda sunt.

76. (11.) Heracleum.

112. H. lanatum, *Michx. Fl. Bor.-Am.* i. p. 116 ; *Yabe, l. c.* p. 101.
Syn. : *H. barbatum*, Ledeb. Fl. Alt. i. p. 300 ; Fl. Ross. ii. p. 322.
Hab. Shakotan ; in moist grassy places.

22. ARALIACEÆ.

77. Aralia.

*113. A. spinosa, *Linn. Sp. Pl.* p. 273 ; *Franch. et Sav. Enum. Pl. Jap.* i. p. 19.
Syn. : *A. chinensis*, Linn. l. c.
A. canescens, Sieb. et Zucc. Fl. Japon. Fam. Nat. no. 419.
Dimorphanthus mandschuricus, Rupr. et Maxim. in Bull. Acad. St. Pétersb. xv. (1856) p. 134.
Hab. Anama.

23. CORNACEÆ.

78. Cornus.

114. (1.) C. canadensis, *Linn. l. c.* p. 117 ; *Miyabe, Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 237.
Syn. : *Arctocrania canadensis*, Nakai, in Tôkyô Bot. Mag. xxiii. (1909) p. 40.
Hab. Shakotan, Shakotan-yama ; in grassy places.

115. (2.) C. suecica, *Linn. l. c.* p. 118 ; *Miyabe, l. c.*
Syn. : *Arctocrania suecica*, Nakai, l. c. p. 39.
Hab. Shakotan, Anama ; in grassy places.

GAMOPETALÆ.

24. CAPRIFOLIACEÆ.

*79. (1.) Adoxa.

*116. A. Moschatellina, *Linn. Sp. Pl.* p. 367.
Hab. Anama.

80. (2.) Sambucus.

117. S. racemosa, *Linn.*, var. pubens, *Trautv. et Mey. Fl. Ochot.* p. 46; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 238.
Syn.: *S. pubens*, Michx. Fl. Bor.-Am. i. p. 181 (1803).
S. racemosa var. *pubescens*, Miq. Cat. Mus. Lugd.-Bat. p. 56.
S. racemosa var. *Sieboldiana*, Matsudaira, List, no. 61, *nec* Miq.
Hab. Shakotan, Anama.

81. (3.) Viburnum.

118. V. Opulus, *Linn.*, var. Sargenti, *Takeda, Beitr.* no. 93.
Syn.: *V. Sargenti*, Koehne, in Gartenfl. 1899, p. 341.
V. Opulus, auct. plur. quoad pl. As. orient.
Hab. Anama.

82. (4.) Lonicera.

119. (1.) L. cœrulea, *Linn.*, var. altaica, *Sweet, Hort. Brit.* ed. 2, p. 258; *Rehd. Monogr.* p. 71.
Syn.: *L. altaica*, Pall. Fl. Ross. tab. 37.
L. cœrulea var. *villosa*, Maxim. in Mél. Biol. x. p. 75, *non* Torr. et Gray; Miyabe, l. c. p. 125.
Hab. Shakotan, between Matakotan and Anama.

120. (2.) L. Maximowiczii, *Rupr.*, var. sachalinensis, *Fr. Schmidt, Reis. Amurl. Sachal.* p. 142; *Rehd. l. c.* p. 116.
Hab. Shakotan, between Anama and Notoro.

25. RUBIACEÆ.
(Gen. 3, spp. 7.)

83. (1.) Rubia.

121. R. grandis, *Komar. Fl. Mansh.* iii. p. 487.
Syn.: *R. tatarica* var. *grandis*, Fr. Schmidt, l. c. p. 144; Maxim. l. c. ix. p. 266; Miyabe, l. c. p. 239.
Hab. Shakotan, Shakotan-yama, Anama; in grassy places.

84. (2.) Galium.

*122. (1.) G. trifidum, *Linn. Sp. Pl.* p. 105 ; *Maxim. in Mél. Biol.* ix. p. 260.
Hab. Shakotan ; in boggy places.

*123. (2.) G. triflorum, *Michx. Fl. Bor.-Am.* i. p. 80 ; *Maxim. l. c.* p. 260.
Hab. Shakotan ; in shady coniferous woods.

124. (3.) G. kamtschaticum, *Steller*, α. hirsutum, *Takeda, in Tôkyô Bot. Mag.* xxiv. (1910) p. 65.
Syn. : *G. obovatum β*, Ledeb. Fl. Ross. ii. p. 412.
Hab. Shakotan, mouth of the Poropet ; in shady moist woods.

*125. (4.) G. boreale, *Linn.*, var. kamtschaticum, *Maxim. Prim. Fl. Amur.* p. 141 ; *in Mél. Biol.* ix. p. 264.
Hab. Near Oiwake ; in boggy places.

126. (5.) G. verum, *Linn.*, var. trachycarpum, *DC. Prodr.* iv. p. 603, forma flore luteo. *Komar. Fl. Mansh.* iii. p. 502.
Syn. : *G. verum* var. *lasiocarpum*, Ledeb. Fl. Ross. ii. p. 415.
G. verum α. typicum, Maxim. in Mél. Biol. ix. p. 265.
Hab. Shakotan, Anama, Matakotan, Debari ; common in grassy places near the beach.

85. (3.) Asperula.

127. A. odorata, *Linn. l. c.* p. 103 ; *Maxim. l. c.* p. 267.
Hab. Between Shakotan and Chipoi ; in woods.

*26. VALERINEÆ.

*86. Patrinia.

*128. (1.) P. sibirica, *Juss. in Ann. Mus. Par.* x. (1807) p. 311 ; *Makino, in Tôkyô Bot. Mag.* xix. (1905) p. 106.
Hab. Anama.

*129. (2.) P. scabiosifolia, *Fisch. ex Link, Enum. Hort. Berol.* i. p. 131 ; *Franch. et Sav. Enum. Pl. Jap.* i. p. 216.
Syn. : *P. hispida*, Bunge, Pl. Mongh.-Chin. i. p. 25, tab. 3.
P. parviflora, Sieb. et Zucc. Fl. Japon. Fam. Nat. no. 678.
Hab. Anama ; in grassy places.

*27. COMPOSITÆ.
(Gen. 21, spp. 34.)

*87. (1.) Eupatorium.

*130. E. sachalinense, *Makino, in Tókyô Bot. Mag.* xxiii. (1909) p. 90.
Syn.: *E. japonicum* var. *sachalinense*, Fr. Schmidt, Reis. Amurl. Sachal. p. 145.
Hab. Near Shakotan, Anama; common in moist places.

88. (2.) Solidago.

131. S. Virgaurea, *Linn. Sp. Pl.* p. 880; *Miyabe, Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 242.
Hab. Shakotan.

89. (3.) Aster.

132. (1.) A. Glehni, *Fr. Schmidt, l. c.* p. 146; *Miyabe, l. c.* p. 240.
Hab. Shakotan, Matsugahama.

*133. (2.) A. Tripolium, *Linn. l. c.* p. 872.
Hab. Anama.

90. (4.) Erigeron.

134. (1.) E. salsuginosus, *A. Gray, in Proc. Am. Acad.* xvi. (1881) p. 93; *Miyabe, l. c.* p. 241.
Hab. Shakotan, Shakotan-yama, Anama.
Obs. Planta valde variabilis, *scapo* et *squamis* involucri vel subglabris parce papillosisque vel villosis, *ligulis* aut pallide violaceis aut purpureis aut albis, *pappo* corolla breviore vel subæquilongo, *corolla* 4–5 mm. longa, plus minusve 5-loba, extus subglabra vel papilloso-villosula. *Scapus* in plantis japonicis semper unicephalus. Specimina yezoensia et kurilensia habent involucrum plerumque glabriusculum. Involucrum speciminum e monte Shakotan-yama villosulum est.

*135. (2.) E. kamtschaticus, *DC.*, var. hirsutus, *Fr. Schmidt, l. c.* p. 147; *Yabe et Yendô, Pl. Shum.* p. 196.
Hab. Shakotan, mouth of the Poropet; in grassy places.

*91. (5.) Leontopodium.

*136. L. kurilense, *Takeda, in Bull. Soc. Bot. Genèv.* 2me sér. iii. (1911) p. 154, cum fig.; *Beauverd, ibid.* iv. p. 23.
Hab. Anama; on rocky cliffs near the sea.

92. (6.) ANAPHALIS.

137. A. MARGARITACEA, *Benth. et Hook. fil. Gen. Plant.* ii. p. 303; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 241.

Hab. Shakotan, Anama.

93. (7.) ACHILLEA.

138. (1.) A. SIBIRICA, *Ledeb. Fl. Ross.* ii. p. 528; *Miyabe, l. c.* p. 241.

Hab. Shakotan, Anama, Tokkari-Masuba.

139. (2.) A. PTARMICA, *Linn.*, var. SPECIOSA, *Herd. Pl. Radd.* iii. 2, p. 39; *Miyabe, l. c.*

Hab. Anama; in grassy places.

94. (8.) MATRICARIA.

140. M. AMBIGUA, *Miyabe, l. c.* p. 242 (1890).

Syn.: *Pyretrum ambiguum*, Ledeb. Fl. Alt. iv. p. 118; Fl. Ross. ii. p. 547.

Chamæmelum tetragonospermum, Fr. Schmidt, Reis. Amurl. Sachal. p. 148.

Hab. Shakotan; in sandy grassy places near the beach.

95. (9.) ARTEMISIA.

*141. A. DESERTORUM, *Spreng. Syst. Veget.* iii. p. 490; *Takeda, Beitr.* no. 86.

Syn.: *A. japonica*, Fr. Schmidt, l. c. p. 149, *non* Thunb. *nec* Sieb. et Zucc.

Hab. Shakotan, Tokkari-Masuba.

Obs. Faurie's specimens nos. 10954 and 1359 have erroneously been referred to this species in my 'Beiträge.' They represent, in fact, *A. japonica*, Thunb., forma *residifolia*, Takeda (*l. c.* no. 87).

*142. (2.) A. SACRORUM, *Ledeb.*, α. LATIFOLIUM, *Ledeb. Fl. Alt.* iv. p. 72; *Fl. Ross.* ii. p. 578; *Maxim. in Mél. Biol.* ix. p. 529; *Takeda, l. c.* no. 88.

Hab. Shakotan, Anama, Tokkari-Masuba; in sandy places along the beach.

143. (3.) A. LACINIATA, *Willd.*, α. LACINIATA, *Maxim. l. c.* p. 530; *Takeda, l. c.* no. 89.

Hab. Shakotan, Anama, Tokkari-Masuba; on cliffs.

144. (4.) A. STELLERIANA, *Bess. in Nouv. Mém. Soc. Nat. Mosc.* iii. (1834) p. 79; *Maxim. l. c.* p. 534.

Hab. Shakotan, Anama, Tokkari-Masuba; common on the beach.

145. (5.) A. VULGARIS, *Linn. Sp. Pl.* p. 848 ; *Bess. in Nouv. Mém. Soc. Nat. Mosc.* iii. (1834) p. 51 ; *Ledeb. Fl. Ross.* ii. p. 585 ; *Maxim. in Mél. Biol.* ix. p. 535.

Var. COMMUNIS, *Ledeb. l. c.* p. 586.

Hab. Shakotan, Anama, etc. ; common in moist places.

Obs. This plant grows generally 5 or 6 feet in height. The leaf is ovate in circumference, twice pinnatisect ; segments lanceolate, acuminate, entire, tomentose with white hairs underneath. Inflorescence elongate, dense. Heads large, erect-patent. Peduncle, bracts, and involucre all thinly arachnoideously pubescent. The same form occurs in Yezo, the Kuriles, and in Kamtschatka.

*Var. LATILOBA, *Ledeb. Fl. Alt.* iv. (1833) p. 83 ; *Fl. Ross.* ii. p. 587.

Syn. : *A. Samamisica*, Bess. l. c. p. 50.
A. vulgaris var. *latifolia*, Bess. l. c. p. 55 ; Takeda, Beitr. no. 90.

Hab. Shakotan-yama, Anama, Tokkari-Masuba ; on grassy cliffs.

146. (6.) A. SCHMIDTIANA, *Maxim. l. c.* p. 537.

Syn. : *A. sericea*, Fr. Schmidt, l. c. p. 150, *nec* Weber ; Miyabe, l. c. p. 243.

Hab. Shakotan, Anama, Notoro, Tokkari-Masuba, Debari ; common on rocks near the sea.

96. (10.) PETASITES.

147. P. JAPONICUS, *Miq.*, var. GIGANTEUS, *Makino, in Tôkyô Bot. Mag.* xxiii. (1909) p. 18.

Hab. Shakotan, between Shakotan and Chipoi, Anama, near Matakotan, along the Ontanipet, Notoro, etc. ; common in shady wet places.

*97. (11.) ARNICA.

*148. A. UNALASCHKENSIS, *Less. in Linnæa*, vi. (1831) p. 238 ; *Makino, l. c.* xv. (1901) p. 93.

Hab. Shakotan, Shakotan-yama, Anama, mouth of the Poropet ; on grassy slopes.

98. (12.) SENECIO.

*149. (1.) S. VULGARIS, *Linn. l. c.* p. 867 ; *Franch. et Sav. Enum. Pl. Jap.* i. p. 251.

Hab. Anama, Tokkari-Masuba ; in waste places.

Obs. Evidently introduced from Yezo where, like in Hontô, the plant has become naturalized.

150. (2.) S. PSEUDO-ARNICA, *Less. l. c.* p. 240 ; *Miyabe, l. c.* p. 244.

Syn. : *S. maritimus*, Koidz. in Pl. Sachal. Nakah. *non* Linn. fil., *nec* Reichb.

Hab. Anama ; on sandy sea-beach.

*151. (3.) S. NEMORENSIS, *Linn. Sp. Pl.* p. 870; *Maxim. in Mél. Biol.* viii. p. 15.

Hab. Near Shakotan, Anama; in grassy places.

Obs. Nostra specimina caule 30–50 cm. alto; *foliis* ovatis, ovato-lanceolatisve, inferioribus obtusis et in petiolum alatum attenuatis, superioribus sessilibus acutis utraque pagina glabris vel subtus ad nervos puberulis margine cartilagineo-serratis; *bracteis* linearibus vel lineari-lanceolatis vel oblanceolatis ciliatis, *squamulis accessoribus* linearibus involucro subduplo longioribus ciliolatis; *involucri phyllis* 5 mm. longis glabris apice barbatis; *ligulis* 5; *acheniis* glabris notabilia.

152. (4.) S. PALMATUS, *Pall. Iter*, iii. p. 321; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 244.

Hab. Shakotan, Anama, Notoro; on hillsides.

99. (13.) LIGULARIA.

153. L. SIBIRICA, *Cass.*, β. VULGARIS, *DC. Prodr.* vi. p. 315; *Koidzumi, in Tôkyô Bot. Mag.* xxiv. (1910) p. 265.

Syn.: *Senecio cacaliifolius*, Schultz Bip. in Flora, xxviii. (1845) p. 50; Miyabe, l. c. p. 244.

Hab. Shakotan, Shakotan-yama, Anama, Inemoshiri; in grassy places.

100. (14.) CACALIA.

154. (1.) C. HASTATA, *Linn.*, α. PUBESCENS, *Ledeb. Fl. Ross.* ii. p. 626.

Syn.: *Senecio sagittatus*, Schultz Bip. l. c. p. 498; Miyabe, l. c.

Hab. Shakotan, Anama, mouth of the Poropet; in wet shady places.

155. (2.) C. AURICULATA, *DC.*, β. KAMTSCHATICA, *Koidz. in Matsumura, Index Pl. Japon.* iii. p. 632.

Syn.: *Senecio davuricus*, Schultz Bip., var. *kamtschatica*, Maxim. l. c. p. 296; Miyabe, l. c.

Hab. Shakotan, between Shakotan and Chipoi, Anama; in shady places.

101. (15.) CNICUS.

156. C. KAMTSCHATICUS, *Maxim.*, α. GENUINUS, *Herd.*; *Maxim. l. c.* p. 310, excl. β.

Syn.: *Cirsium kamtschaticum*, Ledeb. Fl. Ross. ii. p. 736.

Hab. Between Shakotan and Chipoi, Anama; in grassy places.

Obs. Nostra specimina notabilia *foliis* ambitu ovalibus vel late ovalibus, inferioribus petiolatis, superioribus sessilibus amplexicaulibus decurrentibus pinnatisectis vel partitis, segmentis approximatis ovatis acutis patentibus porrectis 1–2-lobatis; *anthodiis* pedunculatis, pedunculis plus minus

arachnoideo-pubescentibus subcernuis; *involucris* hemisphæricis plus minus arachnoideis, squamis setaceis purpurascentibus, exterioribus circa 5 mm., interioribus ad 20 mm. longis, *floribus* purpurascentibus, limbo tubum paululum superante, *filamentis* villosis.

*102. (16.) Saussurea.

*157. S. Riederi, *Herd. Pl. Radd.* iii. no. 185; *Maxim. in Mél. Biol.* viii. p. 243 (var. *yezoensis*); *Matsudaira, List*, no. 70; *Yabe et Yendô, Pl. Shum.* p. 197.

Hab. Anama; on cliffs.

Obs. Planta 25–50 cm. alta, glabra, *foliis* ovatis vel oblongo-ovatis acuminatis, inferioribus longe petiolatis, superioribus subsessilibus, petiolis in foliis inferioribus angustissime in foliis mediis et superioribus sæpe late ciliato-alatis, *involucri phyllis* latis arachnoideo intertextius, virescentioribus, margine fusco-purpureis.

103. (17.) Picris.

158. P. hieracioides, *Linn.*, var. japonica, *Regel, Pl. Radd.* iii. no. 218.

Syn.: *Picris japonica*, Thunb. Fl. Japon. p. 299.

Hab. Shakotan, Anama; in grassy places.

*104. (18.) Hieracium.

*159. H. umbellatum, *Linn.*, var. scabro-hirsuta, *DC. Prodr.* vii. p. 224.

Hab. Anama.

105. (19.) Taraxacum.

*160. T. mongolicum, *Handel-Mazzetti, Monogr.* p. 67 (1907).

Hab. Shakotan.

Obs. Probably introduced.

106. (20.) Lactuca.

161. L. repens, *Benth. in Benth. et Hook. fil. Gen. Pl.* ii. p. 526.

Hab. Shakotan, mouth of the Poropet; on the beach.

107. (21.) Sonchus.

162. S. uliginosus, *Bieb. Fl. Taur. Cauc.* ii. p. 238, iii. p. 525; *Ledeb. Fl. Ross.* ii. p. 834.

Syn.: *S. arvensis* var. *uliginosus*, Trautv.; Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 245.

Hab. Shakotan, Anama; on the shore.

28. CAMPANULACEÆ.

(Gen. 2, spp. 2.)

*108. (1.) Lobelia.

*163. L. sessilifolia, *Lamb. in Trans. Linn. Soc.* x. (1811) p. 260, tab. 6; *Franch. et Sav. Enum. Pl. Jap.* i. p. 275.

Hab. Kompu-usu; in wet places.

109. (2.) Adenophora.

*164. A. latifolia, *Fisch. in Mém. Soc. Nat. Mosc.* vi. p. 165; *DC. Prodr.* viii. p. 492; *Ledeb. Fl. Ross.* ii. p. 894; *Turcz. Fl. Baic.-Dah.* ii. 2, p. 188.

Planta 20–35 cm. alta, glaberrima vel parce hirsuta; *foliis* glabris vel subtus parce hirsutis, 4–6-verticillatis, late ovalibus vel lanceolatis, irregulariter grosseque serratis; *floribus* majusculis; *calycis laciniis* 5–7 mm. longis lanceolatis anguste lanceolatisve integris vel leviter denticulatis; *corolla* usque ad 2 cm. longa, 5–7-loba, stylo incluso; *nectario* 1·5 mm. longo.

Hab. Anama, Kompu-usu; in grassy places.

29. VACCINIACEÆ.

110. (1.) Vaccinium.

165. (1.) V. Vitis-idæa, *Linn. Sp. Pl.* p. 351.

Hab. Shakotan, Shakotan-yama, Anama, Inemoshiri; in grassy places.

166. (2.) V. præstans, *Lamb. in Trans. Linn. Soc.* x. (1811) p. 264; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 246.

Hab. Shakotan, between Shakotan and Chipoi, Anama; in shady places.

167. (3.) V. uliginosum, *Linn. l. c.* p. 350.

Hab. Near Shakotan; in wet grassy places.

111. (2.) Oxycoccus.

168. O. palustris, *Pers. Syn.* i. p. 419; *Maxim. in Mél. Biol.* viii. p. 604.

Syn.: *Vaccinium Oxycoccus*, Linn. l. c. p. 351; Miyabe, l. c. p. 246.

Hab. Between Shakotan and Chipoi, near Oiwake; in wet boggy places.

30. ERICACEÆ.

*112. (1.) Arctous.

*169. A. alpina, *Niedenzu, in Engl. Bot. Jahrb.* xi. (1889) p. 141.

Syn.: *Arbutus alpina*, Linn. l. c. p. 395.

Arctostaphyllos alpina, Spreng. Syst. ii. p. 287; Yabe et Yendô, Pl. Shum. p. 190.

Hab. Summit of Shakotan-yama; rare.

113. (2.) Leucothoë.

170. L. Grayana, *Maxim.*, var. Tschonoskii, *Takeda, in Kew Bull.* 1912, p. 221.

Syn.: *L. Tschonoskii*, Maxim. in Mél. Biol. viii. p. 613.
L. Grayana varr. *intermedia* et *Wrightiana*, Boissieu, in Bull. Herb. Boiss. v. (1897) p. 911.

Hab. Shakotan; in woods.

114. (3.) Rhododendron.

171. (1.) R. chrysanthum, *Pall. Iter*, p. 729, tab. 4. figs. 1–2.

Hab. Summit of Shakotan-yama.

172. (2.) R. kamtschaticum, *Pall. Fl. Ross.* i. p 48, tab. 33.

Hab. Shakotan, Shakotan-yama, Anama, mouth of the Poropet; on rocky cliffs, not uncommon.

115. (4.) Ledum.

173. L. palustre, *Linn.*, var. dilatatum, *Wahlenb. Fl. Lapp.* p. 103; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 248.

Hab. Shakotan, mouth of the Poropet; on wet hillsides.

31. DIAPENSIACEÆ.

116. Diapensia.

174. D. lapponica, *Linn.*, var. obovata, *Fr. Schmidt, Reis. Amurl. Sachal.* p. 161.

Syn.: *D. lapponica* var. *asiatica*, Herd. Pl. Radd. iv. p. 206.

Hab. Summit of Shakotan-yama, mouth of the Poropet.

32. PRIMULACEÆ.

117. (1.) Primula.

175. P. modesta, *Biss. et Moore*, var. Fauriæ, *Takeda, in Notes Roy. Bot. Gard. Edinb.* viii. (1913) p. 88, tab. 19.

Syn.: *P. Fauriei*, Franch. in Bull. Soc. Philom. Paris, 7me. sér. x. (1886) p. 146; Pax in Engl. Pflanzenr. Heft 22, p. 111.
P. farinosa var. *Fauriæ*, Miyabe, l. c. p. 249.

Hab. Shakotan, Anama, Notoro, Kompu-usu; in grassy places and on rocks.

Obs. It is very interesting to know that two forms of this species have been collected by the Abbé Faurie on Mt. Hallaisan, in the Island of Che-ju or Quelpaert.

118. (2.) ANDROSACE.

176. A. CHAMÆJASME, *Host*, var. ARCTICA, *R. Knuth in Engl. Pflanzenr.* Heft 22, p. 190.

Syn.: *A. villosa* var. *latifolia*, Ledeb. Fl. Alt. i. p. 18; Miyabe, l. c. p. 250.

Hab. Mouth of the Poropet; on rocks.

*119. (3.) LYSIMACHIA.

*177. L. VULGARIS, *Linn.*, var. DAVURICA, *R. Knuth, l. c.* p. 304.

Hab. Anama.

120. (4.) TRIENTALIS.

178. T. EUROPÆA, *Linn.*, var. ARCTICA, *Ledeb. Fl. Ross.* iii. p. 25; *Pax et R. Knuth in Engl. Pflanzenr.* Heft 22, p. 315, fig. 66, D; *Takeda, Beitr.* no. 64.

Hab. Shakotan, Shakotan-yama; in grassy places.

*121. (5.) GLAUX.

*179. G. MARITIMA, *Linn. Sp. Pl.* p. 207; *Pax et R. Knuth, l. c.* p. 319, fig. 69.

Hab. Anama, mouth of the Poropet, Notoro; on sandy or marshy shores.

*33. OLEACEÆ.

*122. SYRINGA.

*180. S. AMURENSIS, *Rupr.*, var. JAPONICA, *Franch. et Sav. Enum. Pl. Jap.* ii. p. 435.

Syn.: *Ligustrum amurense*, Rupr., var. *japonicum*, Maxim. in Mél. Biol. ix. p. 395.

Syringa japonica, Decne., in Nouv. Arch. Mus. Paris, 2me sér. ii. (1879) p. 44, tab. 3; Sargent, in Gard. Chron. xxv. (1886) i. p. 560; Nakai, in Tôkyô Bot. Mag. xxv. (1911) p. 62.

Hab. Anama.

Obs. No specific distinction appears to exist between *S. amurensis* and *S. japonica*.

34. GENTIANEÆ.

123. (1.) GENTIANA.

*181. G. JESOANA, *Nakai, l. c.* xxiii. (1909) p. 106, in nota.

Syn.: *G. rigescens* var. *japonica*, Kusnez. Monogr. Eugent. p. 91.

Hab. Poropet swamp, Matsugahama; in wet places.

124. (2.) Swertia.

182. S. tetrapetala, *Pall. Iter*, ii. p. 99, tab. 90. fig. 2.
Hab. Shakotan, Anama, mouth of the Poropet; in grassy places near the sea, common.

125. (3.) Menyanthes.

183. M. trifoliata, *Linn. Sp. Pl.* p. 145.
Hab. Mouth of the Poropet; in wet places near the sea.

35. BORAGINEÆ.

126. (1.) Mertensia.

184. (1.) M. maritima, *S. F. Gray*, subsp. asiatica, *Takeda, in Journ. Bot.* xlix. (1911) p. 222.
Syn.: *M. maritima*, auctor. plur. quoad pl. asiaticam.
Hab. Anama; on the beach.
Obs. This subspecies is distributed over the Far East and also on the coasts of Behring Strait.

185. (2.) M. rivularis, *DC.*, var. japonica, *Takeda, l. c.*
Hab. Shakotan-yama, mouth of the Poropet; in rocky places.

127. (2.) Myosotis.

186. M. intermedia, *Link, Enum. Hort. Berol.* i. p. 164.
Hab. Shakotan; in moist shady places.

*36. SOLANACEÆ.

*128. Solanum.

*187. S. Dulcamara, *Linn.*, var. macrocarpum, *Maxim. in Ind. Sem. Hort. Bot. Petrop.* 1896, *Suppl.* p. 26.
Hab. Anama.

37. SCROPHULARINEÆ.
(Gen. 5, spp. 7.)

129. (1.) Linaria.

188. L. japonica, *Miq. Prol. Fl. Japon.* p. 47.
Syn.: *L. geminiflora*, Fr. Schmidt, Reis. Amurl. Sachal. p. 161.
Hab. Shakotan, Anama, mouth of the Poropet; on sandy beaches.

130. (2.) Scrophularia.

189. S. alata, *A. Gray, Bot. Japan*, p. 101 ; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 253.

Hab. Shakotan, Anama ; in moist places.

131. (3.) Veronica.

*190. V. Schmidtiana, *Regel, α.* typica, *Makino, in Tôkyô Bot. Mag.* xxiv. (1910) p. 102.

Syn. : *V. Schmidtiana*, Regel, in Ind. Sem. Hort. Bot. Petrop. 1864, p. 22.

Hab. Shakotan.

132. (4.) Euphrasia.

191. E. mollis, *Wettst. Monogr.* p. 141, tab. 4. figs. 205–210, tab. 12. fig. 5; *Takeda, Beitr.* no. 22.

Syn. : *E. officinalis*, Miyabe, l. c. p. 254 ; Yabe et Yendô, Pl. Shum. p. 194.

Hab. Shakotan, mouth of the Poropet ; in sandy places near the sea.

133. (5.) Pedicularis.

192. (1.) P. japonica, *Miq. Prol. Fl. Jap.* p. 53.

Syn. : *P. Chamissonis* var. *japonica*, Maxim. in Mél. Biol. x. p. 90.
P. Chamissonis, Miyabe, l. c. ; Yabe et Yendô, l. c. p. 193, non Stev.

Hab. Shakotan, Shakotan-yama, Anama ; in grassy places, common.

Obs. This species was wrongly united with *P. Chamissonis* by Maximowicz. The occurrence of the true *P. Chamissonis* in Hokkaidô has been recorded ; it is, however, doubtful. *P. Chamissonis*, which grows in Unalaschka, possesses smaller flowers with a straight tube and a shorter beak, and larger fruit and seed than those of *P. japonica.*

193. (2.) P. resupinata, *Linn. l. c.* p. 608.

Hab. Mouth of the Poropet, Notoro, Tokkari-Masuba, Kiridôshi ; in grassy places.

*194. (3.) P. venusta, *Schang.*, var. Schmidtii, *T. Itô, Memorial Work, etc., of Keisuke Ito*, i. (1893) p. 75 ; *Nakai, in Tôkyô Bot. Mag.* xxiii. (1909) p. 101.

Syn. : *P. venusta* var., Fr. Schmidt, Reis. Amurl. Sachal. p. 163 ; Maxim. l. c. p. 122.
P. venusta var. *dentifolia*, Bonati.

Hab. Shakotan, Anama ; in grassy places on the cliff.

38. LABIATÆ.

*134. (1.) Elscholtzia.

*195. E. cristata, *Willd. Sp. Pl.* iii. p. 29.
Hab. Anama.

135. (2.) Scutellaria.

196. S. scordiifolia, *Fisch.*

Var. puberula (*Regel*), *Takeda*, comb. nov.
Syn.: *S. galericulata* ε. *puberula*, Regel, Tent. Fl. Ussur. no. 388, p. 119.
S. scordiifolia forma *puberula*, Komar. Fl. Mansh. iii. p. 344; Takeda, Beitr. no. 66.
Hab. Anama; in moist places.

Var. pubescens, *Miq. Prol. Fl. Jap.* p. 42.
Syn.: *S. scordiifolia* forma *pubescens*, Komar. l. c.; Takeda, l. c., excl. syn. nonnul.
S. scordiifolia var. *hirta*, Fr. Schmidt, Reis. Amurl. Sachal. p. 165.
S. galericulata forma *hirta*, Koidz. Pl. Sachal. p. 104.
S. galericulata var. *scordiifolia*, Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 208.
Hab. Shakotan, Anama; on the beach.

136. (3.) Galeopsis.

197. G. Tetrahit, *Linn.*, var. bifida, *Syme, Engl. Bot.* ed. 3, vii. p. 67.
Hab. Shakotan, Anama, Notoro; in wet places.
Obs. The flowers are yellowish or sometimes purplish.

137. (4.) Stachys.

198. S. aspera, *Michx.*, β. baicalensis, *Maxim. in Bull. Soc. Nat. Mosc.* lix. (1879) p. 45.
Hab. Shakotan.

39. PLANTAGINEÆ.

138. Plantago.

199. (1.) P. camtschatica, *Link, Enum. Hort. Berol.* i. p. 120; *Cham. in Linnæa*, i. (1826) p. 165; *Miyabe, l. c.* p. 256.
Hab. Shakotan; on the beach.

200. (2.) P. major, *Linn.*, var. asiatica, *Decne. in DC. Prodr.* xiii. i, p. 695; *Miyabe, l. c.*
Hab. Shakotan.

MONOCHLAMYDEÆ.

40. CHENOPODIACEÆ.

139. (1.) Chenopodium.

201. C. album, *Linn. Sp. Pl.* p. 219.
Hab. Shakotan, Anama, Tokkari-Masuba ; in waste places.
Obs. Probably introduced.

140. (2.) Atriplex.

*202. A. patula, *Linn.*, α. hololepis, *Ledeb. Fl. Ross.* iii. p. 726.
Hab. Anama, Tokkari-Masuba ; on the beach.
Obs. Planta nostra *bracteis* 8 mm. longis ovatis acuminatis utrinque pauci-dentatis vel integris notabilis.

141. (3.) Salsola.

203. S. Soda, *Linn. l. c.* p. 223 ; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 257.
Hab. Shakotan, mouth of the Poropet ; on sandy beaches.

41. POLYGONACEÆ.
(Gen. 3, spp. 8.)

142. (1.) Polygonum.

204. (1.) P. aviculare, *Linn.*, var. vegetum, *Ledeb. l. c.* p. 532.
Hab. Anama.

*205. (2.) P. lapathifolium, *Linn. l. c.* p. 360 ; *Ait. Hort. Kew.* ii. p. 30 ; *Meisn. in DC. Prodr.* xiv. p. 119.
Hab. Tokkari-Masuba ; near the sea-shore.

*206. (3.) P. Yokusaianum, *Makino, in Tôkyô Bot. Mag.* xxviii. (1914) p. 116.
Hab. Shakotan ; in waste places.

207. (4.) P. viviparum, *Linn. l. c.* p. 360 ; *Miyabe, l. c.*
Hab. Shakotan-yama, Anama ; in grassy places.

208. (5.) P. Weyrichii, *Fr. Schmidt*, var. alpinum, *Maxim. in Franch. et Sav. Enum. Pl. Jap.* i. p. 402 ; *id. in Mél. Biol.* ix. p. 617 ; *Miyabe, l. c.*
Syn. : *P. paniculatum*, Meisn. apud Miq. in Ann. Mus. Lugd.-Bat. ii. p. 64, *non* Blume sec. Maxim. l. c.
P. Savatieri, Nakai, in Tôkyô Bot. Mag. xxiii. (1909) p. 414.
Hab. Shakotan, near Matakotan ; on grassy hillsides.

*209. (6.) P. POLYMORPHUM, *Ledeb.*, var. AJANENSE, *Regel et Til.*, forma GLABRESCENS, *Takeda, Beitr.* no. 29.

*143. (2.) OXYRIA.

*210. O. DIGYNA, *Hill, Hort. Kew.* p. 158; *Yabe et Yendô, Pl. Shum.* p. 179.
Syn.: *O. reniformis*, Hook. Fl. Scot. p. 111; Matsudaira, List, no. 21.
Hab. Shakotan.

144. (3.) RUMEX.

*211. R. ACETOSELLA, *Linn.*, α. VULGARIS, *Koch, Synops.* ed. 2, p. 710.
Hab. Shakotan, Anama; in waste places.

*42. SANTALACEÆ.

*145. THESIUM.

*212. T. REPENS, *Ledeb. Fl. Alt.* i. p. 274; *Fl. Ross.* iii. p. 539; *Icon. Fl. Ross.* tab. 233; *Fr. Schmidt, Reis. Amurl. Sachal.* p. 170.
Hab. Shakotan; in grassy places.

43. URTICACEÆ.

146. URTICA.

213. U. PLATYPHYLLA, *Wedd. Monogr.* p. 86; *Takeda, Beitr.* no. 91.
Syn.: *U. dioica* var. *platyphylla*, Wedd. in DC. Prodr. xvi. I. p. 51.
Hab. Shakotan, Anama, and various other places; very common.

44. CUPULIFERÆ.

147. (1.) BETULA.

214. B. ERMANI, *Cham. in Linnæa*, vi. (1831) p. 537, tab. 6. fig. D; *Regel, Monogr. Betulac.* p. 62; *H. Winkl. in Engl. Pflanzenr.* Heft 19, p. 66; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 259.

α. GENUINA, *H. Winkl. l. c.*
Hab. Neighbourhood of Shakotan.

β. ACUTIFOLIA, *H. Winkl. l. c.*
Hab. Between Matakotan and Anama; common on hills.

148. (2.) ALNUS.

215. (1.) A. ALNOBETULA, *Hartig*, var. FRUTICOSA, *H. Winkl. in Engl. Pflanzenr.* Heft 19, p. 106.

Syn.: *A. viridis* var. *sibirica,* Regel, Monogr. Betulac. p. 79, tab. 14. figs. 16–20; Matsumura, Rev. Aln. Japon. in Journ. Coll. Sc. Imp. Univ. Tôkyô, xvi. 5, p. 1.

Hab. Shakotan-yama, Ontanipet.

216. (2.) A. INCANA, *Willd.*

Var. HIRSUTA, *Spach, Rev. Betul.* p. 207; *Matsum. l. c.* p. 12; *H. Winkl. l. c.* p. 123.

Hab. Neighbourhood of Shakotan, Matsugahama.

Var. GLAUCA, *Ait. Hort. Kew.* ed. 2, p. 259; *Matsum. l. c.* p. 10.

Hab. Shakotan (sec. *Matsumura, l. c.*).

Obs. Var. *glauca,* which is not at all uncommon in Hontô, occurs rather seldom in Hokkaidô.

45. SALICINEÆ.

149. SALIX.

217. (1.) S. CAPREA, *Linn. Sp. Pl.* p. 1020; *O. Seem. Sal. Japon.* p. 33, tab. 4. figs. D–H.

Hab. Neighbourhood of Shakotan, Anama, between Matakotan and Anama; not uncommon.

*218. (2.) S. REINII, *Franch. et Sav. Enum. Pl. Jap.* i. p. 459, ii. p. 503; *O. Seem. l. c.* p. 41, tab. 6. figs. A–E.

Hab. Shakotan, Shakotan-yama.

Obs. It is very interesting to find this willow in the Kuriles. The plant is widely distributed in the subalpine region of the high mountains of Hontô and of Yezo.

219. (3.) S. OPACA, *Anderss. in Fr. Schmidt, Reis. Amurl. Sachal.* p. 172; *O. Seem. l. c.* p. 51, tab. 10. figs. A–F.

Syn.: *S. stipularis,* Sm.; Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 260.

S. Pierotii, Matsudaira, List, no. 15, *nec* Miq.

Hab. Shakotan.

46. EMPETRACEÆ.

150. EMPETRUM.

220. E. NIGRUM, *Linn. l. c.* p. 1022.

Hab. Shakotan, Anama, mouth of the Poropet, Notoro, Debari, Inemoshiri; common on rocks near the sea.

Obs. This plant, which is generally met with on the high mountains, grows in the Kuriles and in certain localities in Yezo and in N. Hontô quite close to the sea.

GYMNOSPERMÆ.

47. PINACEÆ.

151. (1.) Larix.

221. L. kurilensis, *Mayr, Monogr. Abiet. Japon.* p. 66.

Syn. : *L. dahurica* var. *japonica,* Maxim. in Regel, Gartenfl. 1871, p. 105 ; Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 261.

L. sibirica, Masters, in Bull. Herb. Boiss. vi. (1898) p. 272, *nec* Ledeb.

Hab. Neighbourhood of Kompu-usu and Kiridôshi ; in more or less humid places, forming a forest ; occurs nowhere else on the island.

152. (2.) Picea.

*222. P. ajanensis, *Fisch. ex Trautv. et Mey. Fl. Ochot.* p. 87 ; *Mayr, l. c.* p. 53 ; *Matsudaira, List*, no. 5.

Hab. Shakotan, Kompu-usu, Matsugahama ; common on hillsides, forming dense forests, often associated with *Abies sachalinensis.*

*153. (3.) Abies.

*223. A. sachalinensis, *Masters, in Gard. Chron.* n. s. xii. (1879) p. 588 ; *Mayr, l. c.* p. 42 ; *Matsudaira, l. c.* no. 6.

Hab. Shakotan, Anama, mouth of the Poropet, Kompu-usu, Kiridôshi, Matsugahama, Chipoi ; very common on hillsides.

154. (4.) Juniperus.

*224. J. chinensis, *Linn.*, var. procumbens, *Endl. Syn. Conif.* p. 21.

Syn. : *J. chinensis*, var. *Sargenti,* Henry, in Trees Gr. Brit. Irel. vi. p. 432.

Hab. Shakotan-yama, Anama, mouth of the Poropet, Kiridôshi ; common on hillsides ; replacing *Pinus pumila*, which is unknown on this island.

48. TAXACEÆ.

155. Taxus.

225. T. cuspidata, *Sieb. et Zucc. Fl. Japon.* ii. p. 61, tab. 128.

Syn. : *T. baccata* subsp. *cuspidata,* Pilg. in Engl. Pflanzenr. Heft 18, p. 112.

Hab. Anama, Debari.

MONOCOTYLEDONES.

49. ORCHIDEÆ.
(Gen. 7, spp. 14.)

156. (1.) Microstylis.

226. M. monophyllos, *Lindl. Gen. Sp. Orchid.* p. 19; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 262.
Hab. Shakotan.

157. (2.) Ephippianthus.

227. E. Schmidtii, *Reichb. fil. in Flora*, li. (1868) p. 33; *Fr. Schmidt, Reis. Amurl. Sachal.* p. 222, tab. 5, figs. 1–7; *Takeda, Beitr.* no. 11.
Syn.: *E. sachalinensis*, Reichb. fil. apud Fr. Schmidt, l. c. p. 180.
Liparis Schmidtii, Benth. *ex* Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 262.
Hab. Between Shakotan and Chipoi, mouth of the Poropet; in woods.

*158. (3.) Listera.

*228. (1.) L. cordata, *R. Br. in Ait. Hort. Kew.* ed. 2, v. 201; *Makino, in Tôkyô Bot. Mag.* xix. (1905) p. 12.
Hab. Mouth of the Poropet; in woods.

*229. (2.) L. nipponica, *Makino, l. c.* p. 9; *Takeda, l. c.* no. 9.
Hab. In the neighbourhood of Shakotan; in woods, rare.

*159. (4.) Spiranthes.

*230. S. australis, *Lindl. in Bot. Reg.* tab. 823, in adnot.; *Gen. & Sp. Orchid.* p. 464; *Matsumura, Index Pl. Japon.* ii. 1, p. 263.
Hab. Anama.

160. (5.) Orchis.

231. O. aristata, *Fisch. ex Lindl. Gen. & Sp. Orchid.* p. 262.
Hab. Anama.

161. (6.) Gymnadenia.

232. G. conopsea, *R. Br. in Ait. l. c.* v. p. 191.
Syn.: *Habenaria conopsea*, Benth. in Benth. et Hook. fil. Gen. Pl. iii. p. 625; Miyabe, l. c. p. 262.
Hab. Shakotan, Anama; on hillsides.

162. (7.) Platanthera.

*233. (1.) P. viridis, *Lindl. Syn. Brit. Fl.* ed. 1, p. 261; *Takeda, Beitr.* no. 52.
Hab. Tokkari-Masuba; in grassy places, rare.

*234. (2.) P. chlorantha, *Cust. ex Reichenb. in Moessl. Handb.* ed. 2, ii. p. 1565; *Takeda, l. c.* no. 80.
Hab. Shakotan, between Shakotan and Chipoi, Anama; in grassy places.

235. (3.) P. minor, *Reichb. fil. in Bot. Zeit.* xxxvi. (1878), col. 75; *Kränzl. Gen. Sp. Orchid.* i. p. 628.
Syn.: *Habenaria japonica* var. *minor*, Miq. Prol. Fl. Japon. p. 139.
H. minor, Miyabe, l. c. p. 263.
Hab. Anama, between Matsugahama and Oiwake; in grassy places.

236. (4.) P. tipuloides, *Lindl. Gen. & Sp. Orchid.* p. 285; *Takeda, l. c.* no. 15.
Hab. Shakotan-yama, between Matakotan and Anama, between Matsugahama and Oiwake; in grassy places, not uncommon.

*237. (5.) P. sachalinensis, *Fr. Schmidt, Reis. Amurl. Sachal.* p. 181; *Takeda, l. c.* no. 14.
Hab. Between Matsugahama and Oiwake; in grassy places, rare.

*238. (6.) P. Makinoi, *Yabe, in Tôkyô Bot. Mag.* xvii. (1903) p. 19; *Takeda, l. c.* no. 19.
Syn.: *Habenaria bracteata*, forma *major*? Matsudaira, List, no. 14.
Hab. Shakotan.

*239. (7.) P. Chorisiana, *Reichb. fil.*, var. elata, *Finet, in Bull. Soc. Bot. France*, xlvii. (1900) p. 278.
Hab. In the neighbourhood of Shakotan, between Shakotan and Chipoi, Shakotan-yama, between Matsugahama and Oiwake; in grassy places.

50. IRIDEÆ.

163. Iris.

240. I. setosa, *Pall. ex Link, Jahrb.* i. 3, p. 71; *Miyabe, l. c.* p. 263.
Hab. Shakotan, Anama, and various other places; very common.

51. LILIACEÆ.
(Gen. 9, spp. 10.)

164. (1.) MAIANTHEMUM.

241. M. BIFOLIUM, *DC.*, var. KAMTSCHATICUM, *Trautv. et Mey. Fl. Ochot.* p. 92.

Hab. Shakotan, between Shakotan and Chipoi, Anama; in woods.

165. (2.) CONVALLARIA.

242. C. MAJALIS, *Linn. Sp. Pl.* p. 314; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890).

Hab. Neighbourhood of Notoro; on hillsides.

166. (3.) HEMEROCALLIS.

243. H. MIDDENDORFFII, *Trautv. et Mey. l. c.* p. 94.

Hab. Shakotan, Anama, mouth of the Poropet, Kompu-usu; common in grassy places.

167. (4.) ALLIUM.

*244. A. LINEARE, *Linn. l. c.* p. 295; *Regel, Monogr.* p. 166; *Yabe et Yendô, Pl. Shum.* p. 177.

Syn.: ? *A. japonicum*, Matsudaira, List, no. 11.

Hab. Shakotan; on hillsides, not common.

168. (5.) LILIUM.

245. (1.) L. DAURICUM, *Ker-Gawl. in Bot. Mag.* sub tab. 1210, in nota; *Miyabe, l. c.*

Hab. Anama, mouth of the Poropet; near the sea.

246. (2.) L. MEDEOLOIDES, *A. Gray, Bot. Japan*, p. 415; *Franch. et Sav. Enum. Pl. Jap.* ii. p. 63, excl. *β*.

Syn.: *L. avenaceum*, Fisch. ex Maxim. in Gartenfl. 1865, p. 290, tab. 485 (*pro parte*, sec. Elwes, Monogr. sub tab. 35); Miyabe, l. c. p. 265.

Hab. Shakotan, Shakotan-yama, Anama; in grassy places, not rare.

Obs. L. medeoloides was first described by A. Gray in 1859 from a single imperfect specimen collected at Hakodaté. R. Oldham, who was sent out from Kew Gardens during 1862–63, collected a lily in Herschel Island, Corea, which was taken by Oliver for Gray's plant (*cf.* Oliver in Journ. Linn. Soc. Bot. ix. (1865) p. 169). Miquel also published, in Ann. Mus. Bot. Lugd.-Bat. iii. p. 156, a description of this Corean lily under the name of *L. medeoloides*,

and Elwes gives an excellent figure of it. He also discusses the affinity and difference between this and *L. avenaceum*. The plant he calls *L. avenaceum* is, however, the true *L. medeoloides*, A. Gray, whilst the other, the Corean lily, is not. For this latter a name, *L. Miquelianum*, has been proposed by Makino (in Tôkyô Bot. Mag. xxiv. p. 301; xxvi. p. 289). It only remains to mention that this Corean lily does not grow wild in Japan proper, but occurs only in Corea and in some parts of China. The plant was introduced into Japan for cultivation as far back as 230 years ago, and a figure of it is given in a gardening book called 'Zôho-Chikin-shô,' vol. vi., published in the year 1710.

169. (6.) Fritillaria.

247. F. camschatcensis, *Ker-Gawl. in Bot. Mag.* sub tab. 1216; *Takeda, Beitr.* no. 68.

Hab. Shakotan, Anama.

*170. (7.) Tofieldia.

*248. T. nutans, *Willd. ex Schultes, Syst.* vii. p. 1573, in obs.; *Takeda, l. c.* no. 70.

Hab. Anama, mouth of the Poropet; on rocks.

171. (8.) Clintonia.

249. C. udensis, *Trautv. et Mey. Fl. Ochot.* p. 92, tab. 30.

Hab. Mouth of the Poropet; in woods.

172. (9.) Veratrum.

250. V. album, *Linn. Sp. Pl.* p. 1044; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 266.

Hab. Neighbourhood of Shakotan, Poropet swamp.

52. JUNCACEÆ.

(Gen. 2, spp. 6.)

173. (1.) Luzula.

251. (1.) L. campestris, *DC.*, var. capitata, *Miq. in Ann. Mus. Bot. Lugd.-Bat.* iii. p. 165; *Buchen. Monogr. Juncac.* p. 160; *id. in Engl. Pflanzenr.* Heft 25, p. 92.

Syn.: *L. campestris* var. *congesta*, Miyabe, l. c. p. 267.

Hab. Shakotan; on hillsides.

252. (2.) L. PILOSA, *Willd. Enum. Pl. Hort. Berol.* p. 393 ; *Buch. in Engl. Pflanzenr.* Heft 25, p. 48 ; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 267.

Hab. Neighbourhood of Shakotan.

Obs. According to Buchenau, *L. pilosa*, Willd., is replaced in Japan by *L. plumosa*, E. Mey. However, our specimens agree very well with the description of the former plant, but not with that of the latter as given by him.

174. (2.) JUNCUS.

*253. (1.) J. BUFONIUS, *Linn. Sp. Pl.* p. 328 ; *Buchen. l. c.* p. 105.

Hab. Near Notoro ; in moist places.

254. (2.) J. EFFUSUS, *Linn.*, var. DECIPIENS, *Buchen.*, forma GRACILIS, *Buchen.* ; *Matsum. Ind. Pl. Japon.* ii. 1, p. 184.

Hab. Shakotan ; in moist places.

255. (3.) J. BALTICUS, *Willd.*, var. HÆNKEI, *Buchen. Monogr. Juncac.* (1890) p. 215 ; *id. in Engl. Pflanzenr.* Heft 25, p. 145.

Hab. Shakotan ; in sandy places near the sea.

256. (4.) J. LAMPOCARPUS, *Ehrh. Calam.* no. 126 ; *Buchen. in Engl. l. c.* p. 217.

Syn. : *J. articulatus,* Linn. l. c. p. 327 ; Miyabe, l. c.

Cæspitosus, *rhizomate* brevi repenti. *Culmi* adscendentes, circa 15 cm. alti, tenues, circa 1 mm. diametro. *Folia* frondosa, vaginis basi coloratis, culmea 2 vel 3, culmo longiora (in planta juvenili) ; auriculæ obtusæ ; lamina a latere valde compressa, usque 2 mm. lata, septis conspicuis. *Inflorescentia* subcomposita, ramis primariis elongatis oblique erectis, sequentibus plerumque distantibus ; bracteis infimis usque 10 mm. longis, latis apice setaceis. *Capitula* parva, diametro ca. 3 mm., 4 mm. longa, 2- usque 5-flora. *Flores* parvi, 3·3 mm. longi ; *tepala* virescentia, late scariosa, externa late lanceolata, acuta, breviter mucronata, interna oblongo-lanceolata, acuta, paululum breviora ; *stamina* 6 ; antheræ 0·5 mm. longæ, filamenta æquantes ; stylus brevissimus. *Fructus* non vidi.

Hab. Kompu-usu ; in wet places.

Obs. My specimens agree with Prof. Miyabe's specimens collected on the Island of Eturup.

53. AROIDEÆ.

*175. (1.) ARISÆMA.

*257. A. JAPONICUM, *Blume in Rumphia*, i. p. 106 ; *Engl. in DC. Monogr. Phan.* ii. p. 549, excl. var. ; *Takeda, in Kew Bull.* 1912, p. 216.

Hab. Shakotan ; in woods.

176. (2.) Lysichiton.

258. L. camtschatcense, *Schott, in Œsterr. Bot. Wochenbl.* (1857) p. 62; *K. Krause, in Engl. Pflanzenr.* Heft 37, p. 148, cum fig.

Hab. Between Shakotan and Chipoi, Notoro, Poropet swamp; in boggy or swampy places.

*177. (3.) Symplocarpus.

*259. S. fœtidus, *Nutt. Genera*, i. p. 106.

Hab. In woods along the Ontanipet; in wet places.

*54. SCHEUCHZERIACEÆ.

*178. Triglochin.

*260. T. maritimum, *Linn. Sp. Pl.* p. 339; *Buchen. in Engl. Pflanzenr.* Heft 16, p. 8.

Hab. Mouth of the Poropet; in marshy places near the sea.

*55. POTAMOGETONACEÆ.

*179. (1.) Zostera.

*261. Z. pacifica, *S. Watson, in Proc. Am. Acad. Sc. Arts,* xxvi. (1891) p. 131; *Gräbn. in Engl. Pflanzenr.* Heft 31, p. 29.

Hab. Shakotan, Notoro.

*180. (2.) Phyllospadix.

*262. P. Scouleri, *Hook. Fl. Bor. Am.* ii. p. 171, tab. 186; *Gräbn. l. c.* p. 36.

Hab. Shakotan, Notoro.

56. CYPERACEÆ.
(Gen. 3, spp. 17.)

*181. (1.) Eleocharis.

*263. E. palustris, *R. Br. Prodr.* p. 224, in nota; *Yabe et Yendô, Pl. Shum.* p. 174.

Hab. Near Notoro.

*182. (2.) Eriophorum.

*264. E. vaginatum, *Linn. Sp. Pl.* p. 76 ; *Fr. Schmidt, Reis. Amurl. Sachal.* p. 191.

Hab. Between Shakotan and Chipoi ; in boggy places.

183. (3.) Carex.

*265. (1.) C. rara, *Boott*, subsp. capillacea, *Boott*, var. nana, *Kükenth. in Engl. Pflanzenr.* Heft 38, p. 103.

Hab. Between Shakotan and Chipoi ; in swampy places.

266. (2.) C. macrocephala, *Willd. apud Spreng. Syst.* iii. p. 808 ; *Kükenth. l. c.* p. 187.

Hab. Shakotan ; on the beach.

*267. (3.) C. stellulata, *Good. in Trans. Linn. Soc.* ii. (1794) p. 144 ; *Kükenth. l. c.* p. 228.

Hab. Between Shakotan and Chipoi ; in swampy places.

*268. (4.) C. cæspitosa, *Linn.*, var. minuta, *Kükenth. l. c.* p. 329.

Syn. : *C. minuta,* Franch. in Bull. Soc. Philom. Paris, 8me sér. vii. (1895) p. 41.

Hab. Between Shakotan and Chipoi, Poropet swamp ; common in swamps.

*269. (5.) C. Lygbyei, *Hornem. Fl. Dan.* tab. 1888 ; *Kükenth. l. c.* p. 363.

Syn. : *C. cryptocarpa*, C. A. Mey. in Mém. Acad. St. Pétersb. i. (1831) p. 226, tab. 14.

Hab. Mouth of the Poropet ; in wet places.

*270. (6) C. Augustinowiczii, *Meinsh. ex Korshinsky, in Act. Hort. Petrop.* xii. (1892) p. 411 : *Kükenth. l. c.* p. 389.

Syn. : *C. bidentula,* Franch, l. c. p. 41.

Hab. Between Shakotan and Chipoi ; in wet places.

*271. (7.) C. Gmelinii, *Hook. et Arn. Bot. Beechey's Voy.* iii. (1834) p. 118, tab. 27 ; *Kükenth. l. c.* p. 396.

Hab. Neighbourhood of Shakotan ; on hillsides.

Obs. The plant recorded in Miyabe's list as *C. Gmelini* is the next species.

272. (8.) C. SCITA, *Maxim. in Mél. Biol.* xii. p. 564 ; *Kükenth. in Engl. Pflanzenr.* Heft 38, p. 414.

Hab. Anama, Shakotan-yama ; on hillsides.

Var. SCABRINERVIA, *Kükenth. l. c.* p. 415.

Syn. : *C. scabrinervia*, Franch. in Bull. Soc. Philom. Paris, 8me sér. vii. (1895) p. 34.

C. Gmelini, Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 268, *non* Hook. et Arn.

C. sp., Matsudaira, List, no. 8.

C. Buxbaumii, Yabe et Yendô, Pl. Shum. p. 174, *non* Wahlenb.

Hab. Shakotan ; on hillsides.

*273. (9.) C. WRIGHTII, *Franch. l. c.* p. 47 ; *Kükenth. l. c.* p. 443.

Hab. Anama ; on hillsides.

*274. (10.) C. LIMOSA, *Linn.*, var. FUSCO-CUPREA, *Kükenth. l. c.* p. 505.

Hab. Poropet swamp.

*275. (11.) C. MOLLICULA, *Boott, Illustr.* iv. p. 192 ; *Kükenth. l. c.* p. 622.

Hab. Near Notoro ; in wet places.

276. (12.) C. LÆVIROSTRIS, *Blytt ex Blytt et Fries in Botan. Notis.* 1844, p. 24 ; *Kükenth. l. c.* p. 724.

Syn. : *C. rhynchophysa*, C. A. Mey. in Ind. Sem. Hort. Petrop. ix. Suppl. 1844, p. 9 ; Miyabe, l. c. p. 268.

Hab. Neighbourhood of Shakotan, swamp of Poropet.

*277. (13.) C. VESICARIA, *Linn.*, var. MONILE, *Boeck. in Linnæa*, xli. (1877) p. 320 ; *Kükenth. l. c.* p. 726.

Hab. Neighbourhood of Shakotan ; in wet places.

*278. (14.) C. PUMILA, *Thunb. Fl. Japon.* p. 39 ; *Kükenth. l. c.* p. 738.

Hab. Shakotan ; on the beach.

*279. (15.) C. LASIOCARPA, *Ehrh.*, var. OCCULTANS, *Franch. in Nouv. Arch. Mus. Paris*, 3me. sér. x. (1898) p. 89 ; *Kükenth. l. c.* p. 747.

Hab. Neighbourhood of Shakotan ; in wet places.

57. GRAMINEÆ.
(Gen. 18, spp. 26.)

*184. (1.) MISCANTHUS.

*280. M. PURPURASCENS, *Anderss. in Œfvers. K. Vet. Acad. Förhandl. Stockh.* 1855, p. 167 ; *Hack. in DC. Monogr. Phanerogam.* vi. p. 106.

Hab. Anama ; on grassy hillsides.

185. (2.) PHALARIS.

281. P. ARUNDINACEA, *Linn. Sp. Pl.* p. 55 ; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 269.

Hab. Everywhere in wet places and along the streams, very common.

Obs. A specimen collected in the neighbourhood of Anama was infected by a species of *Ustilago.*

186. (3.) HIEROCHLOË.

282. H. BOREALIS, *Ræm. et Schult. Syst.* ii. p. 513 ; *Miyabe, l. c.* p. 269.

Hab. Shakotan.

*187. (4.) MILIUM.

*283. M. EFFUSUM, *Linn. l. c.* p. 61.

Hab. Mouth of the Poropet ; in shady places.

*188. (5.) PHLEUM.

*284. P. PRATENSE, *Linn. l. c.* p. 59 ; *Hack. in Bull. Herb. Boiss.* vii. (1899) p. 647.

Hab. Neighbourhood of Shakotan ; introduced.

189. (6.) AGROSTIS.

*285. (1.) A. SCABRA, *Willd. Enum. Pl. Hort. Berol.* p. 370 ; *Hack. l. c.* p. 648 ; *Yabe et Yendô, Pl. Shum.* p. 176.

Hab. Shakotan.

*286. (2.) A. FLACCIDA, *Hack. l. c.* p. 649.

Syn. : *A. debilis,* Hack. in litt. *apud* Matsumura, in Tôkyô Bot. Mag. xii. p. 445.

? *A. canina,* Miyabe, l. c. ; Yabe et Yendô, l. c.

Hab. Shakotan.

*190. (7.) CALAMAGROSTIS.

*287. C. VILLOSA, *Mutel,* var. LANGSDORFFII, *Hack. in Sommier, Fl. Ob. infer.* p. 107 ; *id. l. c.* p. 650.

Syn. : *C. purpurea,* Trin. ; Fr. Schmidt, Reis. Amurl. Sachal. p. 202.

Hab. Shakotan, Tokkari-Masuba.

*191. (8.) DESCHAMPSIA.

288. D. FLEXUOSA, *Trin. in Bull. Acad. Sc. St. Pétersb.* i. (1836) 66.

Hab. Shakotan.

*192. (9.) TRISETUM.

*289. T. FLAVESCENS, *Beauv.*, var. PURPURASCENS, *Arcang. Comp. Fl. Ital.* ed. 1 (1882) p. 779; *Yabe et Yendô, Pl. Shum.* p. 176.
Hab. Shakotan.

193. (10.) PHRAGMITES.

290. P. COMMUNIS, *Trin. Fund. Agr.* p. 134; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 270.
Hab. Shakotan (sec. *Miyabe*).

194. (11.) MELICA.

291. M. NUTANS, *Linn. Sp. Pl.* p. 66; *Miyabe, l. c.*
Hab. Shakotan, Anama.

*195. (12.) BRYLKINIA.

*292. B. CAUDATA, *Fr. Schmidt, Reis. Amurl. Sachal.* p. 199, tab. 8. figs. 22–27.
Hab. Between Shakotan and Chipoi; in woods.

196. (13.) POA.

293. (1.) P. ANNUA, *Linn. l. c.* p. 68; *Miyabe, l. c.*
Hab. Shakotan; on road-sides.

*294. (2.) P. SPHONDYLODES, *Trin. in Bunge, Enum Pl. Chin. Bor.* p. 71; *Franch. et Sav. Enum. Pl. Jap.* ii. p. 175.
Hab. Shakotan.

*295. (3.) P. STENANTHA, *Trin.*, var. LEPTOCOMA, *Ledeb. Fl. Ross.* iv. p. 373.
Syn.: *P. leptocoma,* Trin. in Mém. Acad. St. Pétersb. sér. 6, i. (1831) p. 374.
Hab. Shakotan.

*296. (4.) P. CENISIA, *All. Auct. Fl. Pedem.* p. 40; *Ledeb. l. c.* p. 374.
Syn.: *P. distichophylla,* Gaud in Alpina, iii. (1808) p. 35.
Hab. Shakotan.

297. (5.) P. GLUMARIS, *Trin. in Mém. Acad. Petersb.* sér. 6, i. (1831) p. 379; *Miyabe, l. c.* p. 270; *Yabe et Yendô, l. c.* p. 175.
Hab. Tokkari-Masuba.

*197. (14.) GLYCERIA.

*298. G. AQUATICA, *Wahlenb. Fl. Goth.* p. 18.
Syn.: *G. spectabilis,* Mert. et Koch, Deutschl. Fl. i. p. 586.
Hab. Shakotan, between Shakotan and Chipoi; in wet places.

198. (15.) ATROPIS.

*299. A. KURILENSIS, *Takeda*, sp. nov.

Culmus 20–35 cm. altus, tenuis, 3–4-nodis, strictulus vel adscendens, sæpe basi geniculatus, levissimus, rhizomate fibroso estolonifero. *Foliorum* laminæ omnes planæ, 2–3 mm. latæ, vagina paulo breviora, tenues, levissimæ, acuminatæ, ligula rotundato-ovata fere 2 mm. longa integra. *Panicula* 8–13 cm. longa, pallide colorata, laxa, rhachi levi, ramis mox patentibus vel deflexis 3–5-nis pauciramulosis levibus. *Spiculæ* pedicellatæ, 7–8 mm. longæ, 4–6-floræ. *Glumæ steriles* inæquales, leves, margine hyalinæ, integræ; I[ma] 2–2·5 mm. longa, subulata, acuta, uninervis, II[da] 3–3·5 mm. longa, ovato-lanceolata, obtusiuscula, 3-nervis, nervis lateralibus brevioribus. *Gluma fertilis* 3–3·5 mm. longa, oblongo-ovata, apicem versus attenuata, acutiuscula, margine integra, 5-nervis, basi parce pilosa, ad nervos basin versus pilosiuscula, ceterum levis. *Palea* glumam subæquans vel paulo brevior, bifida, in nervis scaberula. *Anthera* 1 mm. longa. *Cariopsis* 2 mm. longa, levis.

Quoad staturam *A. distantem* similis, a qua glabritie, spiculis majoribus, gluma fertili apicem versus angustata, nec rotundata nec fimbriata, palea breviore distinguitur.

Hab. Mouth of the Poropet; in marshy places near the sea.

199. (16.) FESTUCA.

300. (1.) F. OVINA, *Linn. Sp. Pl.* p. 73; *Miyabe, in Mem. Boston Soc. Nat. Hist.* iv. (1890) p. 271.

Hab. Shakotan (sec. *Miyabe*).

301. (2.) F. RUBRA, *Linn. l. c.* p. 74; *Miyabe, l. c.*

Hab. Tokkari-Masuba; near the sea.

200. (17.) ELYMUS.

*302. (1.) E. DAHURICUS, *Turcz. in Bull. Soc. Nat. Mosc.* 1838, p. 105, 1867, p. 62; *Ledeb. Fl. Ross.* iv. p. 331; *Hack. in Bull. Herb. Boiss.* vii. (1899) p. 715.

Syn.: *E. sibiricus*, Fr. Schmidt, l. c. p. 198, *nec* Linn.

Hab. Anama.

303. (2.) E. MOLLIS, *Trin. in Spreng. N. Entd.* ii. p. 72.

Hab. Shakotan, Anama; common on the beach.

201. (18.) SASA.

*304. (1.) S. PANICULATA, *Makino et Shibata, in Tôkyô Bot. Mag.* xv. (1901) p. 25.

Hab. Shakotan, between Matakotan and Anama, Oiwake; very common on hillsides.

*305. (2.) S. NIPPONICA, *Makino et Shibata, l. c.* p. 24.

Var. DEPAUPERATA, *Takeda,* var. nov. An species distincta?

Planta nana. *Culmi* usque ad 20 cm. alti, plus minus geniculati, graciles, glabri, sæpius purpureo-colorati. *Folia* plerumque 3 ad summum culmi aggregata; lamina oblongo-lanceolata, 7–15 cm. longa, 2–3·5 cm. lata, acuminata, basi cuneato-rotundata, supra glabra vel raro parce pilosula, subtus pilosa, venulis utrinque 5–7–8, margine scabra, demum anguste albo-marginata; vagina glabra, sæpe purpurascens, juvenilis ad os fimbrigera; *ligula* brevi coriacea. *Pedunculi* culmos superantes, erecti, graciles, ad 50 cm. alti, *vaginis* glabris, purpurascentibus cum microphyllis. *Inflorescentia* ovata, 5–6 cm. longe, racemosa vel laxe paniculata, rhachi pubescente, ramis solitariis spiculas æquantibus vel iis paulo brevioribus gracillimis pubescentibus. *Spicula* 10–15 mm. longa, pauciflora, angusta, purpurascens. *Glumæ steriles* remotæ, minutissimæ, pubescentes. *Gluma fertilis* 7 mm. longa, acuminata. *Palea* glumæ fere æquilonga.

Hab. Kompu-usu; on hillsides.

PTERIDOPHYTA.

58. LYCOPODIACEÆ.

202. LYCOPODIUM.

*306. (1.) L. CHINENSE, *Christ, in Nuov. Giorn. Bot. Ital.* N. ser. iv. (1897) p. 101, tab. 3. fig. 4; *Takeda, in Tôkyô Bot. Mag.* xxiii. (1909) p. 204, fig. 2.

Syn.: *L. Selago,* Bong. Végét. de Sitcha, p. 175, pro parte.
L. Selago, Fr. Schmidt, Reis. Amurl. Sachal. p. 204, *non* Linn.
L. Selago, Christ, in Bull. Herb. Boiss. iv. (1896) p. 675, *non* Linn.
L. Selago, Hanzawa, in Trans. Sapporo Nat. Hist. Soc. i. p. 135.
L. Miyoshianum, Makino, in Tôkyô Bot. Mag. xii. (1898) p. 36.
L. Selago var. *Miyoshianum,* Makino, l. c. xvi. p. 199.
L. tenuifolium, Herter, in Engl. Bot. Jahrb. xliii. (1909), Beibl. no. 98, pp. 31, 41.

Hab. Summit of Shakotan-yama.

307. (2.) L. OBSCURUM, *Linn. Sp. Pl.* p. 1102; *Takeda, l. c.* p. 211.

Syn.: *L. japonicum,* Maxim. in Mél. Biol. vii. p. 341, *nec* Thunb.; Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 272.

Forma FLABELLATUM, *Takeda, in Tôkyô Bot. Mag.* xxiii. (1909) p. 212.
Syn.: *L. dendroideum*, Michx. Fl. Bor.-Am. ii. p. 282.
Hab. Inemoshiri, between Matsugahama and the Poropet swamp.

Forma JUNIPEROIDEUM, *Takeda, l. c.* p. 213.
Syn.: *L. juniperoideum*, Sw. Syn. Fil. pp. 178, 401.
Hab. Between Matsugahama and the Poropet swamp.

308. (3.) L. CLAVATUM, *Linn. Sp. Pl.* p. 1101; *Takeda, l. c.* p. 218.
Syn.: *L. japonicum*, Thunb. Fl. Japon. p. 341.
Hab. Shakotan-yama, near Notoro.

59. SELAGINELLACEÆ.

203. SELAGINELLA.

309. S. HELVETICA, *Link, Fil. Hort. Berol.* p. 159; *Takeda, l. c.* p. 238.
Hab. Shakotan, mouth of the Poropet; in sandy or rocky places near the sea.

60. EQUISETACEÆ.

204. EQUISETUM.

310. (1.) E. ARVENSE, *Linn. l. c.* p. 1061; *Milde, Monogr.* p. 218.
Hab. Shakotan.

*311. (2.) E. PALUSTRE, *Linn. l. c.*; *Milde, l. c.* p. 323.
Hab. Neighbourhood of Anama.

312. (3.) E. HYEMALE, *Linn. l. c.*; *Milde, l. c.* p. 511.
Hab. Shakotan, Anama.

61. OPHIOGLOSSACEÆ.

205. BOTRYCHIUM.

313. B. LUNARIA, *Sw. in Schrad. Journ. Bot.* 1800, II. p. 110; *Prantl, in Jahrb. des K. Bot. Gart.* iii. p. 336; *Miyabe, l. c.* p. 273.
Hab. Shakotan.

62. POLYPODIACEÆ.
(Gen. 8, spp. 11.)

206. (1.) Woodsia.

314. W. polystichoides, *Eat.*, *α.* nudiuscula, *Hook. Gard. Ferns*, sub tab. 32.
Hab. Shakotan, Anama, Inemoshiri; on rocks.

*207. (2.) Matteuccia.

*315. M. Struthiopteris, *Todaro, Syn. Pl. Acot. Vasc. Silicia*, p. 30; *C. Christ. Ind. Fil.* p. 420.
Hab. In woods along the Ontanipet.

208. (3.) Dryopteris.

316. (1.) D. fragrans, *Schott, Gen. Fil.* ad tab. 9; *Takeda, Beitr.* no. 75.
Syn.: *Aspidium fragrans*, Sw. Syn. Fil. p. 51; Miyabe, in Mem. Boston Soc. Nat. Hist. iv. (1890) p. 274.
Hab. Shakotan; on rocks.

317. (2.) D. dilatata, *A. Gray*, var. deltoidea (*Milde*), *Takeda, l. c.* no. 37.
Syn.: *Asplenium spinulosum*, Miyabe, l. c. p. 275, *nec* Baker.
Hab. Shakotan; in woods.

*318. (3.) D. Phegopteris, *C. Christ, l. c.* p. 284.
Hab. Matsugahama; in woods.

*209. (4.) Polystichum.

*319. P. Braunii, *Fée, Gen. Fil.* p. 52; *Takeda, l. c.* no. 36.
Hab. Mouth of the Poropet; in woods.

210. (5.) Athyrium.

320. (1.) A. Filix-fœmina, *Roth, in Röm. Mag.* ii. i. (1799) p. 106.
Syn.: *Asplenium Filix-fœmina*, Bernh.; Miyabe, l. c.
Hab. Shakotan, mouth of the Poropet; in woods.

*321. (2.) A. pterorachis, *Christ, in Bull. Herb. Boiss.* iv. (1896) p. 668.
Hab. In woods along the Ontanipet.

*211. (6.) Coniogramme.

*322. C. fraxinea, *Diels, in Engl. u. Prantl, Pflanzenfam.* i. 4, p. 262 ; *C. Christ. l. c.* p. 185.

Hab. In woods along the Ontanipet.

*212. (7.) Cryptogramme.

*323. C. crispa, *R. Br.* ; *C. Christ, l. c.* p. 187 ; *Makino, in Tokyo Bot. Mag.* xix. (1905) p. 105.

Hab. Shakotan-yama ; in rocky places.

213. (8.) Pteridium.

324. P. aquilinum, *Kuhn*, var. osmundaceum, *Christ, Farnkr. d. Erde*, p. 54 (1900).

Hab. Neighbourhood of Shakotan ; on hillsides, not common.

TABLE OF DISTRIBUTION OF THE SHIKOTAN PLANTS.

The same *species* occurring in other districts is shown with *, the same *variety* as that occurs in Shikotan with †, the same *subspecies* with s., and the same *form* with f.; n. being a *naturalized* plant. In case the occurrence is doubtful, symbols are in parentheses. The number placed before each species corresponds to that in the foregoing Enumeration.

	Species representing the Flora of Shikotan.	Hontô.	Sakhalien.	Yezo.	Kunashiri.	Eturup.	Urup and Chiripoi.	Shimoshiri up to Shashikotan.	Poromoshiri.	Shumshu.	Okhotsk and Kamtschatka.	Amur to Manchuria.	Corea, incl. Quelpaert.	China.	N. America, incl. the Aleutian Ids.	Europe.
1.	Clematis fusca, *Turcz.*	*	...	*	...	...	...	*	...	...	†	*†	*			
2.	Thalictrum sachalinense, *Lecoy.*	...	*	*	...	...	...	...	...	...	...	...	*			
3.	,, minus, *Linn.*	*†	*	*†	*†	...	...	...	...	*	*	*	*	*	...	*†
4.	Anemone debilis, *Fisch.*	*	*	*	...	*	...	...	...	...	*	*				
5.	,, narcissiflora, *Linn.*	*	†	*†	...	†	†	...	†	†	†	*†	*	*	*	*
6.	,, Taraoi, *Takeda*	*	...	*	...	...	†	†	...	†						
7.	Ranunculus acris, *Linn.*	*†	*†	*†	†	†	†	...	...	...	*†	*†	*	*†	*†	*†
8.	,, repens, *Linn.*	...	*	*	...	...	...	...	...	*	*	*	*	*	*	*
9.	Caltha palustris, *Linn.*	*	*†	*†	...	*	...	...	...	*	*	*	*	*(†)	*	*
10.	Aconitum kurilense, *Takeda*	...	...	..	...	(*)										
11.	Actæa spicata, *Linn.*	*	*	*	...	...	...	...	...	...	*	*	*	*	...	*
12.	Cimicifuga fœtida, *Linn.*	*	*	†	...	†	...	...	...	...	*	*†	*	*	...	*
13.	,, simplex, *Wormsk.*	*	*	*	..	*	...	...	...	...	*	*	*	*		
14.	Pæonia obovata, *Maxim.*	*	*	*	...	...	...	...	...	...	*	*	*	*		
15.	Corydalis ambigua, *Cham. et Schlecht.*	...	*†	*†	...	†	†	...	†	†	*	*				
16.	Barbarea orthoceras, *Ledeb.*	*	*	*	*	*	...	...	*	*	(*)	*	*	..	*	*
17.	Arabis japonica, *A. Gray*	*	*	*	...	*	*	...	*	*	...	*	*			
18.	,, lyrata, *Linn.*	*	*	*	...	...	*	*	...	*	*	...	*	...	*	
19.	Cardamine impatiens, *Linn.*	*	*	*	...	...	...	...	...	...	...	*	*	*	...	*
20.	,, flexuosa, *With.*	*†	†	†*	...	...	...	...	†	†	†	*†	*†	*	*†	*
21.	Draba borealis, *DC.*	...	*	*	*	*	*	...	*	*	*	*	...	...	*	
22.	Capsella Bursa-pastoris, *Moench*	*	*	*	*	*	...	...	...	...	*	*	*	*	*	*
23.	Isatis oblongata, *DC.*	...	(*)	(*)	...	...	...	...	...	...	*	*				
24.	Viola Patrinii, *DC.*	*†	...	*†	...	...	...	...	...	...	...	*†	*†	*†		
25.	,, Selkirkii, *Pursh*	*	*	*	*	*	...	...	..	..	*	*	*	*	*	
26.	,, sylvestris, *Kit.*	...	*	*	...	...	*	...	...	*	*	...	...	...	...	*

27. Dianthus superbus, *Linn.*	*	*	*	*	*	...	..	...	...	*	*	*	*	...	*
28. Silene repens, *Patr.*	...	†	...	...	†	...	...	...	...	*†	*†				
29. Cucubalus baccifer, *Linn.*	†	...	†	...	...	...	...	...	...	...	†	†	*	...	*
30. Cerastium rigidulum, *Takeda*															
31. „ boreale, *Takeda*	...	...	*	...	*										
32. Stellaria media, *Cyr.*	*	*	*	...	*	...	...	...	*	*	*	*	*	*	*
33. „ ruscifolia, *Willd.*	*	...	*	*	*	*	...	*	*	*	*				
34. „ longifolia, *Muehl.*	...	*	*	*	...	...	...	...	..	*	*	*	...	*	
35. „ sachalinensis, *Takeda*	*	*	*	...	*	*	*	...	*	*	*				
36. „ humifusa, *Rottb.*	...	†	†	...	...	...	...	...	...	†	†	...	...	*	
37. Ammodenia peploides, *Rupr.*	†	†	†	...	†	†	†	...	†	*†	*†	†	...	*†	*
38. Mœhringia lateriflora, *Fenzl*	*	*	*	*	*	...	...	...	*	*	*	*	...	*	*
39. Sagina saginoides, *Dalla Torre*	...	*	...	*	...	...	*	...	*	...	*	*	*	*	*
40. Hypericum erectum, *Thunb.*	*	*	*	(*)	*	...	...	...	...	...	*	*	*		
41. Actinidia Kolomicta, *Maxim.*	*	*	*	*	*	...	...	...	...	...	*	*	*		
42. Geranium yezoense, *Franch. et Sav.*	(*)	...	*	*	*										
43. „ erianthum, *DC.*	...	*	*	...	*	*	*	*	*	*	*	...	...	*	
44. Oxalis Acetosella, *Linn.*	*	*	*	...	*	...	...	...	...	*	*	*	*	*	*
45. Impatiens Noli-tangere, *Linn.*	*	*	*	...	...	...	...	...	...	*	*	*	*	*	*
46. Phellodendron amurense, *Rupr.*	*	...	*	...	...	...	...	...	...	...	...	*			
47. Ilex crenata, *Thunb.*	*	*	*	*	*										
48. Vitis Coignetiæ, *Pull.*	*	*	*	*	*										
49. Acer pictum, *Thunb.*	*†	*†	*†	*	*	...	...	...	...	...	*†	*	*		
50. Rhus Toxicodendron, *Linn.*	†	†	†	†	†	...	...	...	...	...	...	...	...	*†	
51. Thermopsis fabacea, *DC.*	*	*	*	*	*	*	...	...	*	*	*	...	...	*	
52. Trifolium Lupinaster, *Linn.*	*	*	*	*	*	...	...	...	...	*	*	*	*		
53. „ repens, *Linn.*	n.	n.	n.	...	...	...	...	...	...	...	*	...	...	...	*
54. Oxytropis retusa, *Matsumura*	...	...	...	...	...	*	*								
55. Hedysarum obscurum, *Linn.*	...	†	†	†	†	†	†	†	†	*†	*†	...	*	*	*
56. Lespedeza bicolor, *Turcz.*	*	...	*	...	*	...	...	...	...	...	*	*	*		
57. Vicia Cracca, *Linn.*	*†	*	†	†	†	...	...	...	...	*	*†	*	*	*	*
58. Lathyrus maritimus, *Bigel.*	*	*	*	...	*	*	*	*	*	*	*	*	*	*	*
59. „ palustris, *Linn.*	*	†	†	†	†	...	...	...	†	*†	*†	*	*	*	*
60. Maackia amurensis, *Rupr. et Maxim.*	†	...	†	...	...	...	...	...	...	...	*	*			
61. Prunus Maximowiczii, *Rupr.*	*	*	*	*	...	...	...	...	...	...	*	*			
62. „ Ssiori, *Fr. Schmidt*	*	*	*	*	*	...	...	...	...	...	*	..	*		
63. Aruncus sylvester, *Kostel.*	*	*	*†	†	†	†	...	...	†	†	*	*	*	*	*
64. Spiræa media, *Schmidt*	...	†	†	...	...	...	...	...	...	*	*†	...	*	...	*
65. „ betulifolia, *Pall.*	*	*	*	...	*	*	...	*	...	*	*	...	*	*	
66. „ salicifolia, *Linn.*	†	†	†	...	...	...	...	...	...	*†	*†	†	†	*†	†
67. Sorbaria sorbifolia, *A. Br.*	†	*†	†	†	...	...	...	...	...	*	*†				
68. Filipendula kamtschatica, *Maxim.*	*	*	*	...	*	*	...	*	*	*	*				

	Species representing the Flora of Shikotan.	Hontô.	Sakhalien.	Yezo.	Kunnashiri.	Eturup.	Urup and Chiripoi.	Shimoshiri up to Shashikotan.	Poromoshiri.	Shumshu.	Okhotsk and Kamtschatka.	Amur to Manchuria.	Corea, incl. Quelpaert.	China.	N. America, incl. the Aleutian Ids.	Europe.
69.	Rubus Idæus, *Linn.*	*	†	†	†	†	...	...	...	...	*†	*†	...	...	*	*
70.	Geum strictum, *Ait.*	*	*	*	...	*	...	...	...	...	*	*	*	*	*	*
71.	„ calthifolium, *Sm.*	†	...	†	...	†	†	†	†	†	...	...	...	...	*†	
72.	Fragaria neglecta, *Lindem.*	...	*	*	...	...	...	...	...	...	...	*				
73.	Potentilla fruticosa, *Linn.*	*	*	...	...	*	...	...	...	*	*	*	*	*	*	*
74.	„ fragarioides, *Linn.*	*†	*†	*†	†	†	†	...	...	*	*	*	*	*		
75.	„ Anserina, *Linn.*	*	*	*	*	*	*	...	...	*	*	*	...	...	*	*
76.	„ megalantha, *Takeda*	...	*	*	...	*	*	*	...	*						
77.	Agrimonia pilosa, *Ledeb.*	*	*	*	*	*	...	...	...	...	...	*	*	*	...	*
78.	Sanguisorba tenuifolia, *Fisch.*	*	*	*	*	*	...	...	*	...	*	*†	*	*		
79.	Rosa acicularis, *Lindl.*	*	†	†	†	†	...	...	...	...	*	*†	*	*	*	*
80.	„ rugosa, *Thunb.*	*	*	*	...	*	*	...	*	*	*	*	*	*		
81.	Sorbus sambucifolia, *Roem.*	*	*	*	*	*	*	...	*	*	*	*	...	...	*	
82.	„ commixta, *Hedl.*	*	*	*	*	*	...	...	...	...	...	...	*			
83.	Saxifraga cortusifolia, *Sieb. et Zucc.*	*	...	*	*	...	...	...	...	...	...	*	*	*		
84.	„ fusca, *Maxim.*	*	...	*†	†	*	*	...	*							
85.	„ reflexa, *Hook.*	...	*	*	...	...	...	...	...	...	...	...	...	...	*	
86.	„ bronchialis, *Linn.*	*†	†	†	...	...	...	...	...	...	*†	*†				
87.	Parnassia palustris, *Linn.*	*	*	*	*	*	*	...	...	*	*	*	*	*	*	*
88.	Hydrangea paniculata, *Sieb.*	*	*	*	*	...	...	...	...	...	...	...	...	*		
89.	„ petiolaris, *Sieb. et Zucc.*	*	*	*	...	*	...	...	...	...	...	...	*	*		
90.	Ribes latifolium, *Jancz.*	*	*	*	*	*	...	...	...	...	...	*				
91.	Sedum Rhodiola, *DC.*	*	*	*	*	*	*	*	*	*	*	*	*	...	*	*
92.	„ kamtschaticum, *Fisch.*	...	*	*	*	*	*	...	...	...	*	*	*	*		
93.	Drosera rotundifolia, *Linn.*	*	*	*	*	*	...	...	*	*	*	*	..	...	*	*
94.	Lythrum Salicaria, *Linn.*	*	*	*	...	*	...	...	...	...	*	*	*	*	*	*
95.	Epilobium palustre, *Linn.*	*	*	*	...	...	...	...	...	*	*	*	...	...	*	*
96.	„ lineare, *Muehl.*	...	*	...	...	...	...	...	...	...	...	...	...	...	*	
97.	„ glandulosum, *Lehm.*	*	...	*	...	(*)	...	...	...	...	*	*	...	...	*	
98.	„ shikotanense, *Takeda*															
99.	„ ovale, *Takeda*	...	...	...	...	...	...	...	(*)							
100.	Circæa alpina, *Linn.*	*	*	*	...	*	...	...	...	*	*	*	*	*	*	*
101.	Bupleurum longifolium, *Linn.*	...	(†)	†	...	...	...	...	...	...	...	†	...	†	...	*†

102.	Bupleurum longeradiatum, *Turcz.*	†	†	†	†	…	…	…	…	…	…	*†	*	*		
103.	Ægopodium alpestre, *Ledeb.*	*	*	*	…	*	(*)	…	…	…	*	*	*	*		
104.	Seseli Libanotis, *Koch*	*	…	*	†	…	…	…	…	…	…	*	…	*	…	*
105.	Phellopteris littoralis, *Benth.*	*	*	*	…	*	*	…	…	*	*	*	*	*	*	
106.	Ligusticum scoticum, *Linn.*	*	*	*	…	*	*	*	*	*	*	*	…	…	*	*
107.	Conioselinum kamtschaticum, *Rupr.*	…	*	*	*	*	*	*	…	…	*	*				
108.	Cnidium ajanense, *Drude*	*	*	*	…	*	*	…	…	…	*	*				
109.	Pleurospermum austriacum, *Hoffm.*	*	*	*	..	*	*	…	…	…	*	*	…	*		
110.	Angelica reflecta, *Fr. Schmidt*	…	*	*	…	*	…	…	…	…	*					
111.	Cœlopleurum Gmelini, *Ledeb.*	…	*	*	…	*	*	*	*	*	*	*	…	…	*	
112.	Heracleum lanatum, *Michx.*	*	*	*	*	*	*	…	*	…	*	…	*	*	*	
113.	Aralia spinosa, *Linn.*	*	*	*	*	…	…	…	…	…	…	*	*	*	*	
114.	Cornus canadensis, *Linn.*	*	*	*	*	*	…	…	…	…	*	*	*	…	*	
115.	,, suecica, *Linn.*	…	*	*	…	…	*	*	*	*	*	*	..	…	*	*
116.	Adoxa Moschatellina, *Linn.*	*	*	*	…	…	…	…	…	…	*	*	*	*	*	*
117.	Sambucus racemosa, *Linn.*	*†	†	*†	…	†	…	…	…	…	*†	*	*	*	*†	*
118.	Viburnum Opulus, *Linn.*	†	†	†	…	†	…	…	…	…	†	†	†	†	…	*
119.	Lonicera cærulea, *Linn.*	*	†	*	†	†	†	†	†	†	†	*	*	*	*	*
120.	,, Maximowiczii, *Rupr.*	†	†	†	†	†	…	…	…	…	…	*	…	*		
121.	Rubia grandis, *Komar.*	…	*	*	*	*	…	…	…	…	*	*	*			
122.	Galium trifidum, *Linn.*	*	*	*	…	*	…	…	…	*	*	*	*	…	*	*
123.	,, triflorum, *Michx.*	*	…	…	…	…	…	…	…	…	…	…	…	…	*	
124.	,, kamtschaticum, *Stell.*	*	*	*	…	*	…	…	…	*	…	*	*	…	*	
125.	,, boreale, *Linn.*	…	†	†	…	…	…	…	…	*	†	*†	*	*	*	*
126.	,, verum, *Linn.*	*†	*†	*†	†	†	†	…	…	…	*	*	*	*	…	*
127.	Asperula odorata, *Linn.*	*	*	*	*	*	…	…	…	…	…	…	…	…	…	*
128.	Patrinia sibirica, *Juss.*	…	…	*	…	*	…	…	…	…	*	*				
129.	,, scabiosifolia, *Fisch.*	*	*	*	…	…	…	…	…	…	…	*	*	*		
130.	Eupatorium sachalinense, *Makino*	*	*	*	*											
131.	Solidago virgaurea, *Linn.*	*	*	*	*	*	*	…	…	…	*	*	*	*	*	*
132.	Aster Glehni, *Fr. Schmidt*	*	*	*	*	*	*									
133.	,, Tripolium, *Linn.*	*	*	*	…	…	…	..	…	…	*	*	…	*	…	*
134.	Erigeron salsuginosus, *A. Gray*	*	…	*	*	…	*	…	…	…	…	…	…	…	*	…
135.	,, kamtschaticus, *DC.*	†	†	…	…	…	…	…	…	†	*					
136.	Leontopodium kurilense, *Takeda*	..	…	…	…	(*)										
137.	Anaphalis margaritacea, *Benth. et Hook. f.*	*	*	*	*	*	*	…	*	*	*	*	…	*	*	*
138.	Achillea sibirica, *Ledeb.*	*	*	*	*	*	…	…	*	*	*	*	*	*		
139.	,, Ptarmica, *Linn.*	†	†	†	†	†	†	…	…	†	*	*	*	…	*	*
140.	Matricaria ambigua, *Miyabe*	*	*	*	*	*	…	…	…	…	*	*	…	…	*	*
141.	Artemisia desertorum, *Spreng.*	…	*	*	*	…	…	…	…	…	…	*				
142.	,, sacrorum, *Ledeb.*	…	*	*	*	…	…	…	…	…	*	*	*	*	…	*
143.	,, laciniata, *Willd.*	…	…	*	*	*	…	…	…	…	*	*	…	*		

	Species representing the Flora of Shikotan.	Hontô.	Sakhalien.	Yezo.	Kunashiri.	Eturup.	UrupandChiripoi.	Shimoshiri up to Shashikotan.	Poromoshiri.	Shumshu.	Okhotsk and Kamtschatka.	Amur to Manchuria.	Corea, incl. Quelpaert.	China.	N. America, incl. the Aleutian Ids.	Europe.
144.	Artemisia Stelleriana, *Bess.*	*	*	*	*	*	...	...	*	*	*	*	...	...	*	*
145.	,, vulgaris, *Linn.*, var. communis, *Ledeb.*	*	(†)	†	†	†	†	†	†	†	†	†	†	*	*	*
145.	,, vulgaris, *Linn.*, var. latiloba, *Ledeb.*		†	†	†	†	†	...	...	...	...	†	...			
146.	,, Schmidtiana, *Maxim.*	...	*	*	*	*	*									
147.	Petasites japonicus, *Miq.*	*†	†	†	†	†	†	†								
148.	Arnica unalaschkensis, *Less.*	*	...	*	...	*	*	...	...	...	...	...	...	...	*	
149.	Senecio vulgaris, *Linn.*	*	...	*	...	*	...	...	...	...	...	*	...	...	*	*
150.	,, Pseudo-Arnica, *Less.*	*	*	*	...	*	...	*	*	*	*	*	...	...	*	
151.	,, nemorensis, *Fisch.*	*	*	*	...	...	...	...	...	...	*	*	*	*	...	*
152.	,, palmatus, *Pall.*	*	*	*	...	...	*	*	...	*	*	*	...	*		
153.	Ligularia sibirica, *Cass.*	*	*	*	...	*	...	...	...	...	*	*	*	*	...	*
154.	Cacalia hastata, *Linn*	*	*	*	*	*	*	...	...	...	*	*	*	*	*	*
155.	,, auriculata, *DC.*	...	*	†	*	*	*	*	...	*	*†	*				
156.	Cnicus kamtschaticus, *Maxim.*	...	...	...	*	*	*	...	*	*	*					
157.	Saussurea Riederi, *Herd.*	(*)	*	*	*	*	*	...	*	*	*					
158.	Picris hieracioides, *Linn.*	†	†	†	...	†	†	...	†	†	†	†	†	†	...	*
159.	Hieracium umbellatum, *Linn.*	*	*	*	*	...	...	...	...	...	*	*	*	*	*	*
160.	Taraxacum mongolicum, *Handel-Mazzetti*	*	*	*	*	*	*	...	*	*	*	*	...	*		
161.	Lactuca repens, *Benth.*	*	*	*	*	*	*	...	...	*	*	*	*	*		
162.	Sonchus uliginosus, *Bieb.*	*	*	*	...	*	...	*	...	*	...	*	...	*	...	*
163.	Lobelia sessilifolia, *Lamb.*	*	*	*	*	*	...	...	...	...	*	*	*			
164.	Adenophora latifolia, *Fisch.*	*	...	*	...	...	...	...	...	..	*	*	*	*		
165.	Vaccinium Vitis-idæa, *Linn.*	*	*	*	*	*	*	*	...	*	*	*	*	*	*	*
166.	,, præstans, *Lamb.*	*	*	*	*	*	...	...	*	*	*	*				
167.	,, uliginosum, *Linn.*	*	*	*	...	*	...	...	*	*	*	*	*	...	*	*
168.	Oxycoccus palustris, *Pers.*	*	*	*	*	*	...	...	...	*	...	*	...	...	*	*
169.	Arctous alpina, *Nied.*	*	*	*	...	...	*	*	...	*	*	*	...	...	*	*
170.	Leucothoë Grayana, *Maxim.*	*†	...	*†												
171.	Rhododendron chrysanthum, *Pall.*	*	*	*	...	*	*	*	...	*	*	*	*	*	...	..
172.	,, kamtschaticum, *Pall.*	*	*	*	...	*	...	*	*	*	*	*	...	...	*	
173.	Ledum palustre, *Linn.*	†	†	†	†	†	†	...	...	...	*	*†	*	...	*	*†
174.	Diapensia lapponica, *Linn.*	†	†	†	...	†	†	...	...	†	†	†	...	...	*	*
175.	Primula modesta, *Biss. et Moore*	*†	...	*†	†	†	†	†	...	..	...	...	*†			

176.	Androsace Chamæjasme, *Host*	...	...	...	...	...	†	...	†	...	*†	*	...	*	*†	*
177.	Lysimachia vulgaris, *Linn.*	*†	†	†	...	...	...	...	...	...	...	*†	*†	*†	...	*†
178.	Trientalis europæa, *Linn.*	*†	*	*†	...	†	†	†	†	†	†	*†	*	*	*†	*
179.	Glaux maritima, *Linn.*	*	*	*	...	*	...	...	...	...	*	*	*	*	*	*
180.	Syringa amurensis, *Rupr.*	†	...	†	...	...	...	...	...	...	...	*	*			
181.	Gentiana jesoana, *Nakai*	...	*	*												
182.	Swertia tetrapetala, *Pall.*	*	...	*	*	*	*	...	*	*	*	*				
183.	Menyanthes trifoliata, *Linn.*	*	*	*	*	*	...	...	*	...	*	*	*	...	*	*
184.	Mertensia maritima, *S. F. Gray*	s.	s.	s.	s.	s.	s.	...	s.	s.	s.	(s.)	s.	...	* s.	*
185.	,, rivularis, *DC.*	...	...	†	...	†	†	...	...	...	*	*				
186.	Myosotis intermedia, *Link*	*	...	*	...	...	...	...	...	...	...	...	...	...	...	*
187.	Solanum Dulcamara, *Linn.*	*(†)	*	*(†)	...	...	...	...	...	...	...	*	*	*	...	*
188.	Linaria japonica, *Miq.*	*	*	*	*	*	*	...	...	...	*	*	*			
189.	Scrophularia alata, *A. Gray*	*	*	*	*	*	*	...	...	...	...	*				
190.	Veronica Schmidtiana, *Regel*	*	*	*	...	*										
191.	Euphrasia mollis, *Wettst.*	...	...	*	...	*	*	...	...	*	*	...	...	...	*	
192.	Pedicularis japonica, *Miq.*	*	...	*	*	*	*	...	*	*						
193.	,, resupinata, *Linn.*	*	*	*	*	*	*	...	*	...	*	*	*	*	...	*
194.	,, venusta, *Schang.*	...	†	†	...	†	†	...	...	...	*	*	...	*		
195.	Elscholtzia cristata, *Willd.*	*	...	*	...	...	...	...	...	...	...	*	*			
196.	Scutellaria scordiifolia, *Fisch.*	*	*	*	*	...	...	...	...	...	*	*	*	*		
197.	Galeopsis Tetrahit, *Linn.*	n.	*	*	...	*	...	...	...	...	*	*	*	...	...	*
198.	Stachys aspera, *Michx.*	†	†	†	†	†	...	...	...	...	†	†	†	†	*	
199.	Plantago camtschatica, *Link*	*	*	*	...	*	*	...	...	...	*	*	*			
200.	,, major, *Linn.*	†	†	†	...	†	...	...	...	...	†	†	†	†	*	*
201.	Chenopodium album, *Linn.*	*	*	*	...	*	...	...	...	...	*	*	*	*	*	*
202.	Atriplex patula, *Linn.*	*	*	*	...	...	...	...	...	...	...	*	...	...	*	*
203.	Salsola Soda, *Linn.*	*	*	*	...	*	...	...	...	...	*	*	*	*	...	*
204.	Polygonum aviculare, *Linn.*	*†	*	*†	...	*	...	...	...	...	*	*†	*†	*†	*	*
205.	,, lapathifolium, *Linn.*	*	*	*	...	*	...	...	...	...	*	*	*	*	*	*
206.	,, Yokusaianum, *Makino*	*	...	*	...	...	...	...	...	...	...	(*)	*			
207.	,, viviparum, *Linn.*	*	...	*	...	*	*	...	...	...	*	*	*	*	*	*
208.	,, Weyrichii, *Fr. Schmidt*	*†	*	*	...	†	†									
209.	,, polymorphum, *Ledeb.*	*	...	†	...	†	...	...	...	...	†	*	*	...	*	*
210.	Oxyria digyna, *Hill*	*	*	...	...	...	*	*	*	*	*	*	...	...	*	*
211.	Rumex Acetosella, *Linn.*	*	*	*	...	*	...	...	...	...	...	*	*	...	*	*
212.	Thesium repens, *Ledeb.*	...	*	...	...	...	...	...	...	...	...	*				
213.	Urtica platyphylla, *Wedd.*	*	*	*	*	...	...	...	...	...	*					
214.	Betula Ermani, *Cham.*	*	*	*	...	*	...	...	...	...	*	*				
215.	Alnus Alnobetula, *Hartig*	†	†	†	...	†	†	...	...	...	†	†	*(†)	†	*	*
216.	,, incana, *Willd.*	*	†	*†	..	...	...	...	...	...	*	*†	*†	...	*	*
217.	Salix Caprea, *Linn.*	*	*	*	*	*	...	...	...	...	*	*	*	*	...	*

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218.	Salix Reinii, *Franch. et Sav.*	*	...	*												
219.	,, opaca, *Anderss.*	*	*	*	...	...	...	...	...	...	...	*	...	...	...	*
220.	Empetrum nigrum, *Linn.*	*	*	*	*	*	*	...	*	*	*	*	*	...	*	*
221.	Larix kurilensis, *Mayr*	...	...	...	...	*										
222.	Picea ajanensis, *Fisch.*	*	*	*	*	*	...	...	...	...	*	*	*			
223.	Abies sachalinensis, *Masters*	...	*	*	*	*										
224.	Juniperus chinensis, *Linn.*	*†	†	†	†	†	...	...	...	...	...	...	*†	*		
225.	Taxus cuspidata, *Sieb. et Zucc.*	*	...	*	...	*	*	*	...	...	...	...	*			
226.	Microstylis monophyllos, *Lindl.*	*	...	*	...	*	..	...	...	...	...	*	*	*	*	*
227.	Ephippianthus Schmidtii, *Reichb. fil.*	*	*	*												
228.	Listera cordata, *R. Br.*	*	*	*	...	*	...	...	...	...	...	*	...	...	*	*
229.	,, nipponica, *Makino*	*	*	*	...	*										
230.	Spiranthes australis, *Lindl.*	*	*	*	*	...	...	...	...	...	...	*	*	*		
231.	Orchis aristata, *Fisch.*	*	*	*	*	*	*	*	...	*	*	...	...	...	*	
232.	Gymnadenia conopsea, *R. Br.*	*	*	*	...	*	...	...	...	...	*	*	*	*	...	*
233.	Platanthera viridis, *Lindl.*	*	...	*	...	...	*	...	...	...	...	*	...	...	...	*
234.	,, chlorantha, *Cust.*	*	...	*	*	*	...	...	...	...	*	*	*	*	...	*
235.	,, minor, *Reichb. fil.*	*	...	...	...	*										
236.	,, tipuloides, *Lindl.*	*	*	*	...	*	...	...	...	...	*	*				
237.	,, sachalinensis, *Fr. Schmidt*	*	*	*	...	*										
238.	,, Makinoi, *Yabe*	*	...	*	...	*										
239.	,, Chorisiana, *Reichb. fil.*	*†	...	†	...	...	...	...	...	...	...	...	...	...	*	
240.	Iris setosa, *Pall.*	*	*	*	...	*	*	...	...	*	*	*	*	...	*	
241.	Maianthemum bifolium, *DC.*	*	†	†	...	†	†	†	†	†	*†	*†	*†	*	*†	*
242.	Convallaria majalis, *Linn.*	*	*	*	...	*	...	...	...	...	*	*	*	*	*	*
243.	Hemerocallis Middendorffii, *Trautv. et Mey.*	*	*	*	*	*	...	...	...	*	*	*	*	*		
244.	Allium lineare, *Linn.*	...	*	*	...	...	...	...	*	*	*	*	*	*		
245.	Lilium dauricum, *Ker-Gawl.*	...	*	*	*	*	...	...	...	...	*	*	*	*		
246.	,, medeoloides, *A. Gray*	*	*	*	*	*	*	...	*	...	*	*				
247.	Fritillaria camschatcensis, *Ker-Gawl.*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
248.	Tofieldia nutans, *Willd.*	*	*	*	...	*	...	...	...	...	...	*	...	...	*	
249.	Clintonia udensis, *Trautv. et Mey.*	*	*	..	...	...	...	...	...	...	*	*	*	*		
250.	Veratrum album, *Linn.*	*	*	*	...	*	*	...	...	*	*	*	*	*	...	*

251.	Luzula campestris, *DC.*	*†	*	...	...	†	...	...	...	...	*	*	*(†)	*	*	*
252.	,, pilosa, *Willd.*	*	...	...	...	*	...	...	...	...	...	*	...	...	...	*
253.	Juncus bufonius, *Linn.*	*	*	*	...	*	...	...	...	...	*	*	*	*	*	*
254.	,, effusus, *Linn.*, var. decipiens, *Buchen.*	† f.	†	† f.	...	f.	...	...	...	...	†	†	†	†	*	*
255.	,, balticus, *Willd.*	*	†	*†	...	†	†	†	†	†	†	†	...	...	*†	*
256.	,, lampocarpus, *Ehrh.*	...	*	*	...	*	...	...	...	...	...	*	*	*	*	*
257.	Arisæma japonicum, *Blume*	*	*	*	*	*	...	...	...	...	...	*	*	*		
258.	Lysichiton camtschatcense, *Schott*	*	*	*	*	*	*	...	...	...	*	*	...	...	*	
259.	Symplocarpus fœtidus, *Nutt.*	*	*	*	...	...	...	...	...	...	*	*	...	...	*	*
260.	Triglochin maritimum, *Linn.*	*	*	*	*	...	...	...	...	...	*	*	...	*	*	*
261.	Zostera pacifica, *S. Watson*	*	*	*	...	*	...	...	...	...	...	*	...	(*)	*	
262.	Phyllospadix Scouleri, *Hook.*	*	*	*	...	*	*	...	...	...	...	...	...	...	*	
263.	Eleocharis palustris, *R. Br.*	*	*	*	...	...	...	...	...	*	*	*	*	*	*	*
264.	Eriophorum vaginatum, *Linn.*	*	*	*	*	*	*	...	...	*	*	*	...	...	*	*
265.	Carex rara, *Boott*, ssp. capillacea, *Boott*	s.†	s.†	s.†	...	...	...	...	...	...	...	...	s.	s.		
266.	,, macrocephala, *Willd.*	*	*	*	...	...	...	...	...	...	*	...	*	*	*	
267.	,, stellulata, *Good.*	*	...	*	...	...	...	...	...	...	...	...	...	*	*	*
268.	,, cæspitosa, *Linn.*	*	...	*†	...	...	...	...	...	...	...	...	...	...	...	*
269.	,, Lygbyei, *Hornem.*	*	*	*	*	*	...	...	...	...	*	*	...	...	*	*
270.	,, Augustinowiczii, *Meinsh.*	...	*	*	...	*	...	...	...	...	...	*	*			
271.	,, Gmelinii, *Hook. et Arn.*	...	*	*	...	*	...	*	...	...	*	*	...	...	*	
272.	,, scita, *Maxim.*	*	...	*†	...	†	†	†	†	†	*					
273.	,, Wrightii, *Franch.*	*	...	*	...	*										
274.	,, limosa, *Linn.*	†	*	†	†	†	...	...	...	...	...	*	*	...	*	*
275.	,, mollicula, *Boott*	*	...	*	...	*	...	...	...	...	...	...	*			
276.	,, lævirostris, *Blytt*	*	*	*	*	*	...	...	...	...	*	*	...	...	...	*
277.	,, vesicaria, *Linn.*	*	*	*†	...	...	...	...	...	...	*	*	*	*†	*	*
278.	,, pumila, *Thunb.*	*	...	*	...	...	...	...	...	...	...	*	*	*		
279.	,, lasiocarpa, *Ehrh.*	...	†	†	†	...	...	...	...	...	...	*†	...	†	*	*
280.	Miscanthus purpurascens, *Anderss.*	*	...	*	...	...	...	...	...	...	...	*	*	*		
281.	Phalaris arundinacea, *Linn.*	*	*	*	*	*	*	...	...	...	*	*	*	*	*	*
282.	Hierochloë borealis, *Roem. et Schult.*	*	*	*	*	*	...	...	...	..	*	*	*	*	*	*
283.	Milium effusum, *Linn.*	*	*	*	...	*	...	...	...	...	*	*	*	*	*	*
284.	Phleum pratense, *Linn.*	n.	n.	n.	...	*	...	...	...	...	...	...	...	...	*	*
285.	Agrostis scabra, *Willd.*	*	...	*	...	*	...	...	...	*	*	*	*	*	*	
286.	,, flaccida, *Hack.*	*	*	*	...	*	...	...	...	*						
287.	Calamagrostis villosa, *Mutel*	*	*	*	...	...	...	...	...	...	*	*	*	*	*	*
288.	Deschampsia flexuosa, *Trin.*	*	*	*	...	*	...	*	*	*	*	*	...	...	*	*
289.	Trisetum flavescens, *Beauv.*	*	*	*	...	...	...	...	†	†	*	*	...	...	...	*
290.	Phragmites communis, *Trin.*	*	*	*	...	*	..	...	...	...	*	*	*	*	*	*
291.	Melica nutans, *Linn.*	*	*	*	...	...	...	...	...	...	*	*	*	*	...	*
292.	Brylkinia caudata, *Fr. Schmidt*	*	*	*												

	Species representing the Flora of Shikotan.	Hontô.	Sakhalien.	Yezo.	Kunnashiri.	Eturup.	Urup and Chiripoi.	Shimoshiri up to Shashikotan.	Poromoshiri.	Shumushu.	Okhotsk and Kamtschatka.	Amur to Manchuria.	Corea, incl. Quelpaert.	China.	N. America, incl. the Aleutian Ids.	Europe.
293.	Poa annua, *Linn.*	*	*	*	...	*	...	...	...	...	*	*	*	*	*	*
294.	,, sphondylodes, *Trin.*	*	...	*	...	...	...	...	...	...	*	*	*	*		
295.	,, stenantha, *Trin.*	*	...	*	...	*	...	...	...	...	*†	*	...	...	*†	
296.	,, cenisia, *All.*	...	...	...	...	*	...	...	...	...	*	*	...	...	...	*
297.	,, glumaris, *Trin.*	...	*	*	*	...	...	...	...	*	*	*	...	...	...	*
298.	Glyceria aquatica, *Wahlenb.*	*	*	*	...	...	...	...	...	...	*	*	...	...	...	*
299.	Atropis kurilensis, *Takeda*	...	...	...	...	(*)										
300.	Festuca ovina, *Linn.*	*	*	*	...	*	...	...	...	*	*	*	*	*	*	*
301.	,, rubra, *Linn.*	*	*	*	...	...	...	...	...	*	*	*	*	...	*	*
302.	Elymus dahuricus, *Turcz.*	*	*	*	*	*	...	...	...	...	...	*	*			
303.	,, mollis, *Trin.*	*	*	*	*	*	*	...	*	*	*	...	*	...	*	
304.	Sasa paniculata, *Makino et Shibata*	*	*	*	*											
305.	,, nipponica, *Makino et Shibata*	*	...	*												
306.	Lycopodium chinense, *Christ*	*	*	*	...	...	...	...	...	...	...	*	*	*	*	
307.	,, obscurum, *Linn.*	*	*	*	*	*	...	...	...	...	*	*	...	...	*	
308.	,, clavatum, *Linn.*	*	*	*	*	*	...	*	...	*	*	*	*	*	*	*
309.	Selaginella helvetica, *Link*	*	...	*	...	...	...	...	...	...	...	*	*	*	...	*
310.	Equisetum arvense, *Linn.*	*	*	*	...	...	*	...	...	*	*	*	*	*	*	*
311.	,, palustre, *Linn.*	*	*	*	...	...	...	...	...	...	...	*	*	...	*	*
312.	,, hyemale, *Linn.*	*	*	*	*	...	*	...	...	*	*	*	*	*	*	*
313.	Botrychium Lunaria, *Sw.*	*	*	*	...	...	...	...	...	*	*	*	*	...	*	*
314.	Woodsia polystichoides, *Eat.*	*	*	*	...	*	...	...	...	...	...	*	*	*		
315.	Matteuccia Struthiopteris, *Todaro*	*	*	*	*	...	...	...	...	...	*	*	*	*	*	*
316.	Dryopteris fragrans, *Schott*	*	*	*	...	...	...	...	...	...	...	*	*	...	*	
317.	,, dilatata, *A. Gray*	*	*	*	...	*	...	...	...	*	*	*	*	*	*	*
318.	,, Phegopteris, *C. Christ.*	*	*	*	...	...	...	...	...	...	*	*	*	...	*	*
319.	Polystichum Braunii, *Fée*	*	*	*	...	...	...	...	..	...	...	*	*	...	*	*
320.	Athyrium Filix-fœmina, *Roth*	*	*	*	...	...	...	...	...	...	*	*	*	*	*	*
321.	,, pterorachis, *Christ.*	*	*	*	...	...	...	...	...	...	...	...	*			
322.	Coniogramme fraxinea, *Fée*	*	*	*	...	...	...	...	...	...	...	...	*	*		
323.	Cryptogramme crispa, *R. Br.*	*	...	*	...	...	...	...	...	...	...	...	...	...	...	*
324.	Pteridium aquilinum, *Kuhn*	*	*†	*	...	...	...	...	...	...	*	*†	*	*	*	*†
324	Total Number of Species occurring in each District ...	268	259	302	123	210	98	40	55	99	202	249	177	149	151	152

The Evolution of the Inflorescence.

By J. PARKIN, M.A., F.L.S., Trinity College, Cambridge *.

(PLATE 18, and 9 Text-figures.)

[Read 18th December, 1913.]

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I. INTRODUCTION.

THE study of the Inflorescence from the evolutionary point of view has been strangely neglected. The treatment of this subject appears hardly as yet to have advanced beyond the limits of pure description. Botanical text-books have been and are still in the main content with a formal treatment of the Inflorescence. In these the various types of flower-groupings are at the outset sharply divided into the two classes, racemose and cymose ; then follow concise descriptions of the various kinds contained in the two categories. No attempt is made to connect racemose with cymose inflorescences, nor to trace the evolution of flower-clusters from some simple arrangement, as is to be found in the solitary terminal, or even in the single axillary flower. The account of the Inflorescence in one botanical text-book appears usually as a slavish copy of what occurs in an earlier work of a similar kind. The subject, in fact, is dealt with in a rather perfunctory fashion.

* A brief exposition of most of the views expressed in this paper was given before the Botanical Section of the British Association at the Winnipeg Meeting (for Abstract see "The Annual Report," 1909, p. 662). Since then the author has not seen reason to depart essentially from any of the views there given.

Thus the study of flower-branching and arrangement, which at the best is perhaps not a particularly attractive subject, remains duller than it otherwise might be through this "cut and dried" manner of treatment. Hence an effort is here made to give these "dry bones" of descriptive morphology "flesh," or at any rate some semblance of "flesh."

In this paper an attempt is made not only to connect together cymose and racemose types of inflorescences, but also to trace all flower-groupings from one primitive source, viz.:—a leafy shoot bearing a solitary terminal flower. From such a shoot, simple cymose flower-clusters will be shown to arise first; and then from these, will be traced the evolution of racemose forms. The raceme or spike originating thus, is consequently by no means an early form of inflorescence, but one which has had a cymose ancestry.

Even the solitary axillary flower is shown to be capable of derivation indirectly from the terminally borne flower. Thus is attempted the evolutionary connection of all flower-arrangements found in Angiosperms *.

In this paper a new term is introduced for that kind of flower-cluster, the main axis of which continues to grow vegetatively after emitting the flowers. The name *intercalary* is proposed for this. And, finally, it is shown that such intercalated flower-clusters may give rise to what are here termed *pseudo-terminal* inflorescences, through the arresting of the vegetative continuation of the main axis. Such an inflorescence, in regard to the order in which the individual flowers composing it bloom, appears identical with a racemose cluster which has arisen from a cymose panicle. Hence it is pointed out that racemose inflorescences (racemes, spikes, umbels, etc.), may arise in two totally different ways, viz.:—from cymose groupings or from intercalary inflorescences. Reasons are given for regarding these two kinds of inflorescences as distinct in origin and morphological value. The one, the intercalary, has merely resulted from the segregation of separate flower-bearing shoots; while the other, the cymose, has arisen by the production of something essentially new in the history of the plant, namely, additional flowers alongside the originally solitary terminal flower. Most inflorescences probably belong to the latter category. The recognition, however, of the former type is looked upon as one of the novel features of this paper.

Most of the evidence for the views thus briefly formulated, has been culled from an examination of fresh plants; resort has been had to some extent to herbarium specimens; but very little use has been made of systematic descriptions or drawings of plants. Descriptive remarks applicable to inflorescences or the way the flowers are borne, to be found in systematic and

* It might be more correct to write here, "Dicotyledons," as this paper is almost wholly restricted to a consideration of the inflorescences of this group. The Monocotyledons in the author's opinion are an early offshoot from the Dicotyledons, much modified, and so of less use in studying the evolution of flower-grouping.

other botanical works, are often of a vague character, so that little reliance can be placed upon them as to the true nature of the flower-arrangement. This may not be surprising. Without an evolutionary basis for the classification of the inflorescence, the connecting or intermediate forms, the ones of especial value in this paper, are apt to be the least clearly described. Hence a more complete understanding as to how flower-clusters have arisen, and as to how the various kinds have evolved one from another, would assist the systematist in the formulation of his descriptions; and then these latter would convey to the morphologist, seeking data, clearness as to how the flowers are borne, and as to the order in which they bloom.

As the author has, therefore, not thought fit to utilise to any extent information respecting the Inflorescence to be obtained from systematic descriptions of genera and species, the evidence brought forward in the succeeding pages may appear less complete than it otherwise might. If systematic descriptions could have been used, then the gaps in the study of the genera dealt with could have been readily filled. The examination in the fresh state of all the species known of a fairly large genus is a matter both of time and of difficulty. It seemed hardly desirable to postpone the publication of the paper till this had been done for the various genera here considered; especially as the evidence has been drawn from examples widely scattered among the Dicotyledons, and does not depend solely on the investigation of one or two families. Also, at this stage it seemed fitting to elaborate a working hypothesis by the aid of which the subject can be further studied.

Before closing this Introduction it may be well to draw attention to the following fact, which will be self-evident from a perusal of the main part of this paper, namely, that the evolution of inflorescences from solitary terminal flowers on the lines thus briefly indicated, has taken place independently in several families of Angiosperms. Though there may have been slight differences in detail, yet in each case the evolution has advanced by essentially the same steps.

N.B.—To avoid repetition in the explanations accompanying the diagrammatic text-figures, attention is called here to the fact that the individual flowers are represented by circles and the order of their expansion by numerals (1, 2, 3, etc.).

II. Historical.

Before commencing a short review of the literature bearing on this paper, it may be well to explain clearly the meaning here attached to the term "*Inflorescence*."

Linnæus * appears to have been responsible for the introduction of

* Linnæus, C., 'Phil. Bot.', Stockholmiæ, p. 112, 1751.

the term, which literally means the time of flower-bearing. It was applied by the great Swedish naturalist to the arrangement of the flowers on the axis or axes. Asa Gray * proposed the term "Anthotaxy," to correspond with phyllotaxy, as preferable to that of "Inflorescence" for denoting flower-arrangement. However, the latter has persisted and is now in constant use in Botany, so little advantage would be gained by discarding it for another.

Inflorescence has often been defined as the mode of branching of the floral axis. Van Tieghem † implies as much, though he proceeds to write that the term is sometimes given a concrete meaning by applying it to the floral group itself. Bentham and Hooker ‡, in their 'British Flora,' supply a comprehensive definition including both ideas. "The inflorescence of a plant is the arrangement of the flowering branches and of the flowers upon them. An inflorescence is a flowering branch or the flowering summit of a plant above the last stem leaves, with its branches, bracts and flowers."

It seems futile to quibble over the question whether inflorescence means the mode of floral branching or the flower-group itself. Custom has sanctioned the latter meaning. When we speak of the inflorescence of a plant we employ the word as a concrete noun and apply it to the flower-cluster itself. It is in this sense that the word is used in this paper. The mode of branching of the flower-bearing axes of the inflorescence becomes one line for study. The sequence in which the individual flowers open is another. The character of the internodes, such as their proportional length or their suppression, is a third. The origin of flower-clusters and the phylogenetic relationship between the various kinds, that is to say the evolution of the inflorescence, furnish a further line of investigation, embracing as it were all the others.

Literature on the subject of the Evolution of the Inflorescence is indeed scanty. Eichler gave the lead in his 'Blüthendiagramme,' 1875, to an evolutionary study of the inflorescence, but it has hardly at all been followed.

To Linnæus § we are indebted for the names of the common forms of flower-groupings such as cyme, raceme, spike, umbel, etc.

Robert Brown ‖, that deep-sighted observer, who, though never voluminous in his writings, usually managed to alight upon something new and fundamental, called attention to some genera of the Compositæ (*Echinops*, *Lagascea*,

* Gray, Asa, 'Structural Botany,' 6th edit., London, p. 141, 1879.

† Tieghem, P. E. L. van, 'Traité de Botanique,' 2nd edit., p. 342, 1891.

‡ Bentham, G., 'Handbook of the British Flora,' 6th edit., by J. D. Hooker, p. xxii, 1892.

§ Linnæus, C., Systema Naturæ, ed. 12, Tom. ii. Holmiæ, p. 16, 1767.

‖ Brown, R., Trans. Linnean Soc., London, vol. xii. (1818) pp. 93–95.

Cæsulia), in which the florets of the capitulum expanded in the reverse way, commencing to open from the centre outwards instead of from the periphery inwards, as is usual for this family. He deduced from this fact that the capitulum of these genera is in reality a compound one, composed of a number of single-flowered heads—a view now generally held. These inflorescences are referred to later in this paper, as being among the most evolved.

Roeper *, eight years after, revived this view of Robert Brown and, partly from a consideration of it, divided inflorescences into two groups, according to the way in which the individual flowers successively expand. He named the two methods the centripetal and centrifugal respectively. The division of inflorescences into these two main groups has been generally accepted by botanists ever since. The terms racemose and cymose or indefinite and definite, are now more generally used than centripetal and centrifugal respectively. Though each pair of the foregoing terms signifies a different feature concerning the inflorescence ; yet, as a rule, in racemose (indefinite) inflorescences the flowers open centripetally (acropetally) and in cymose (definite) inflorescences centrifugally (basipetally).

Guillard, in 1857, published a highly "philosophic" paper entitled "Idée générale de l'Inflorescence" †. He first calls attention to the great neglect of the study of the Inflorescence. For three quarters of a century he writes that there has been no advance on the ideas of Linnæus. This statement, though partly warranted, is a slight exaggeration in the light of the contributions of Robert Brown and Roeper just considered. Guillard's paper is so full of fine terms and so-called laws that he seems to cloud rather than illuminate the subject. His "lois de progression et de recurrence" apparently fit the modes of development of racemose and cymose inflorescences respectively.

Eichler ‡, as already pointed out, in his great work 'Blüthendiagramme,' treats of the Inflorescence in a truly scientific manner. He shows that a sharp distinction between racemose and cymose inflorescences does not exist in nature, calling attention to the fact that some flower-clusters are a mixture of both. He also definitely states that the one type of inflorescence may pass into the other, but refrains from expressing which he considers the more primitive.

Celakovsky §, in a paper published in 1893, discusses the nature of the panicle, showing that in its manner of flower-expansion, it can be partly centrifugal and partly centripetal. He distinguishes fourteen main forms

* Roeper, J., Mél. bot. de Seringe, No. 5, p. 71, 1826.

† Guillard, A., Bull. Soc. Bot. France, iv. (1857) pp. 29–41.

‡ Eichler, 'Blüthendiagramme,' pp. 33 & 34, 1875.

§ Celakovsky, L. J., "Gedanken über eine zeitgemasse Reform der Theorie der Blutenstande," Bot. Jahrb. f. System (Engler), xvi. (1893) p. 33.

of inflorescence and endeavours to connect them one with another, but he expresses no clear views as regards the general way in which the evolution of flower-clusters has taken place.

An extensive memoir by Hy *, published in 1894, is mainly descriptive with little evolutionary bearing, but is from the point of view of classifying inflorescences of distinct value. He has, however, much to communicate about intermediate types of inflorescence (inflorescences de passage), and apparently would derive indefinite (racemose) from definite (cymose) inflorescences, since one of the sections of his paper is headed "Passage de inflorescences definite à indefinite."

Arber †, in 1899, confining himself to a consideration of indefinite inflorescences, endeavours, by the application of his "theory of internodes," to upset current notions respecting the inter-relationship of the various forms of this kind of flower-grouping. Instead of regarding the spike, umbel, capitulum etc., as derived from the raceme by internodal suppression—the view usually held—he puts forward the opposite idea, and would obtain, for example, the raceme from the spike and the umbel from the capitulum by means of internodal elongation. Personally, I see no reason for departing from the prevailing view, except in so far that a spike may occasionally arise from a spicate cyme, this in its turn having come from a panicle. The same may also sometimes happen in the case of umbels and even heads. That is to say, the inflorescence has undergone internodal suppression before and not after it has become truly racemose.

In Engler's 'Syllabus der Pflanzenfamilien,' 1907 ‡, a short section is devoted to the consideration of the Inflorescence. He writes that the racemose type cannot be placed higher than the cymose or vice versa, particularly as both permit themselves to be derived from a panicle. My reply to this would be that a panicle in its simplest form is nothing but a cyme, and in its more complicated form a transition to a true raceme. He also writes that inflorescences which are phylogenetically the furthest advanced, are those which are so complicated as to resemble a hermaphrodite flower, *e. g.*, those of many Araceæ and Euphorbiaceæ. With this I am in complete agreement.

Church's admirably conceived work, 'Types of Floral Mechanism' §, claims some attention here, as he has ventured, in his treatment of some of the genera selected for study, to deal with the inflorescence from an evolutionary standpoint. The views he expresses run directly counter to mine in

* Hy, H. F., "Les Inflorescence en Botanique Descriptive," Rev. Gén. de Bot. vi. (1894) p. 385.

† Arber, E. A. N., "Relationships of the Indefinite Inflorescences," Journ. Bot. xxxvii. (1899) p. 160.

‡ Engler, A., 'Syllabus der Pflanzenfamilien,' 5th edit., 1907.

§ Church, A. H., 'Types of Floral Mechanism,' Oxford, 1908, pp. 10–13 & 182.

the two chief cases taken, viz., those of *Helleborus* and *Pyrus*. He regards a much branched and many flowered panicle as primitive and a less branched, fewer flowered one as derived from it by reduction. For example, he looks upon the dense inflorescence of *Pyrus Aucuparia* (the Mountain Ash) as the earliest type, and that of *P. Cydonia* (the Quince) with solitary terminal flowers as the latest, among the species dealt with in the genus *Pyrus*. I am tempted here to apply the Euclidean phrase "reductio ad absurdum," though quite aware that there may be cases where a singly borne flower has come from a cluster of many through reduction.

Ewart *, in a small text-book published in 1907, incidentally refers to the relationship of racemose to cymose inflorescences, and considers that the former gave rise to the latter. His remarks are not without interest and bear reproducing here.

"In any case it seems probable that all cymose inflorescences have been derived from racemose ones by a shortening of the main axis and a delay in the development of the lateral branches, to which the main power of growth is at the same time transferred. The cymose inflorescence is certainly an advance upon the racemose type, for in the former new flowers continually appear on the exposed surface of the inflorescence while the fruits ripen securely buried among the older parts of the mass of branches." Further, "if the growing point of a young raceme is destroyed, the power of producing flowers may be temporarily lost, whereas the destruction of the apex of a cyme, involves the loss of a single flower only, and the lateral axes continue their growth with even greater vigour than before." And again, speaking of the compound raceme or panicle, he writes: "This is the most primitive type of inflorescence for it is really the modified upper region of the plant, whereas the simple raceme is more highly differentiated and has become simple by reduction."

Hence hidden away in an elementary primer, we have come across perhaps the most pronounced views yet expressed on the evolution of the inflorescence. Though dissenting from his views in general, yet I am in agreement with him in regarding the simple raceme as having come from the panicle by reduction, that is, by the loss of the tertiary floral axes.

It is not the author's intention to review here the whole of the literature dealing with the inflorescence, but only that part which has any bearing on the general evolution of flower-grouping. However, as it happens, there appear to be few additional papers other than those already alluded to, with the exception of those dealing with the morphological elucidation of the puzzling inflorescences of the Boraginaceæ and Solanaceæ. Of these memoirs, that of

* Ewart, A. J., 'First Stage Botany,' 2nd Edit. [The Organized Science Series], London 1907, p. 127.

Müller* of fairly recent date may be mentioned, as in it full reference is given to the former work on this branch of the subject. As this paper does not profess to extend to a detailed consideration of these peculiar inflorescences, further reference to this part of the literature becomes unnecessary.

III. The General Character and Biological Significance of the Inflorescence.

The main feature which distinguishes an inflorescence from a solitarily placed flower is that in the former there are several (two or more to be accurate) flowers clustered together without foliage leaves intervening, while in the latter there is only one. That is to say, inflorescences come to be formed by the production or segregation of flowers apart from the foliage.

The lateral axes terminated by flowers—the usual components of an inflorescence—like ordinary vegetative shoots, are each borne in the axil of a leaf-structure, but this is no longer foliar in character; it is a much reduced organ with little or no assimilating tissue, termed the *bract*. The lateral (secondary) axis may also bear, besides its terminally placed flower, similar reduced leaf-structures—usually a pair in Dicotyledons—known as *bracteoles.* These may bear in their axils tertiary flower-shoots of a like nature, and in some inflorescences higher series still may be produced: thus the bracteole of one axis becomes the bract of the next and so on.

In many inflorescences, usually ones few flowered and lax in habit, there is no sharp line between where the foliage leaves end and the bracts begin. There is a gradual diminution in the laminæ of the leaves bearing flowers from below upwards, until in the last produced flowers the laminæ have disappeared totally and the bract becomes a truly non-assimilating organ. Such inflorescences the author regards as having remained in a primitive stage. The degree of sharpness with which the inflorescence is marked off from the foliage, shows in a general way the amount of progress in its evolution. The capitulum of the Compositæ, the catkin of the Amentaceæ, to take two examples, represent advanced types of inflorescence, as the flower-cluster in each case is sharply marked off from the foliage.

Three other prominent features showing advancement in the inflorescence may be mentioned here, viz.:—the suppression of internodes resulting in compact clusters, the abortion of bracts or bracteoles or both as in the Cruciferæ, and the differentiation of the individual flowers into two or sometimes three quite dissimilar kinds with definite arrangement of these, *e.g.*, many Compositæ, *Euphorbia*, *Ficus*, *Arum*, etc. Inflorescences of the last type may be looked upon as the highest phylogenetically.

In the first paragraph of this section of the paper the words "production"

* Müller, W., "Beitrage zur Entwicklungsgeschichte der Inflorescenzen der Boragineen und Solaneen," Flora, xciv, p. 385, 1905.

and "segregration" were used in connection with the formation of inflorescences. These words were used expressly to infer that inflorescences could be formed in two fundamentally different ways, in respect to the separation of the individual flowers composing the cluster from the foliage leaves. Let us take a hypothetical tree or shrub which has groups of foliage shoots each axis of which is terminated by a single flower. That is to say, the plant has solitary terminal flowers, but the leafy shoots bearing flowers tend to arrange themselves in groups. Such a group can hardly be considered an inflorescence, as the leaf-structures it contains are all foliar. Imagine the shortening of these shoots and the reduction of all the foliage leaves to bracts. The group of flowering shoots would now become an inflorescence. The author believes that flower-clusters have in several instances arisen by this method of segregation, *e.g.*, intercalary inflorescences, already briefly referred to in the introduction and to be treated of more fully in a later section of this paper.

But this does not seem to be the general way in which inflorescences have evolved. There is reason to think that the majority of inflorescences have arisen in a different manner, not by the segregation of a number of solitarily borne flowers, but by the production *de novo* of lateral flowers alongside the terminal one. The initial stage in the evolution of a flower-cluster from a single terminal flower *may* have been induced by a superabundance of reproductive material, more than the shoot could utilise in the formation of a single flower. One or more lateral flowers might thus be pushed out from the axils of the leaves below the terminal. Once this tendency for the production of laterals became fixed, then the increase in number of flowers composing the inflorescence might be considered to take place at the expense of the size and number of parts of the individual flower. An inflorescence of this type might thus be regarded as the equivalent of a single terminal flower. The facts suggesting this point of view will be dealt with in the next section treating of the "solitary terminal flower."

Another point in the study of the Inflorescence, requiring some clearness in thought, is the recognition of an essential difference between floral and vegetative branching. Failure to grasp this leads to false comparisons and reasonings. In Angiosperms the racemose manner of branching of the *vegetative* shoot is the simpler and would appear to be the primitive. The main (plumular) axis continues growing indefinitely and the lateral shoots arise from it in the ascending order. Cymose vegetative branching is derived from it by the main axis ceasing to grow and by one or more of the upper lateral buds taking on, as it were, the function of the original main axis. If only one of these buds continues the growth in height or length of the plant, the so-called sympodial system of branching results, which is of common occurrence. The apparently simple main axis of such a plant is really a *sympodium* of a number of axes of an ascending series.

But we cannot argue from the above supposed way in which vegetative branching has been evolved, that floral branching of the racemose type is the more primitive; because the very fact of a terminal flower arising, leads to the main axis ceasing to grow. As long as an axis of a plant continues producing successive crops of foliage leaves, then provided that it branches, the branching will be racemose, but when reproductive leaves succeed to foliage leaves, then, in the case of Angiosperms, a flower will be formed. The axis thus ceases to grow further in length. If now the upper—the reproductive—part of this main axis branches to produce one or more lateral flowers, then the branching will be cymose. In fact a simple form of cymose inflorescence will result.

Thus on *a priori* grounds cymose branching of the *reproductive* part of a shoot would seem to be the earlier, even though the opposite would appear to be the case for the *vegetative* part.

If, then, this supposed primitiveness of cymose floral branching can be substantiated on *a posteriori* evidence, then the mode of origin of racemose flower branching (racemose inflorescences) becomes a problem for investigation.

The biological significance of the inflorescence calls for a few remarks. Many may consider that flowers have been clustered together to render them more conspicuous to insect visitors, on the principle that a number of individuals are more easily seen at a distance when grouped together than when scattered widely apart. This might hold if the individual flower continued the same size, when transferred as it were, from a solitary to a clustered position. A comparative study of the species of a genus suggests that, as the number of flowers in an inflorescence increases, the size diminishes —or, in other words, the complexity of an inflorescence is in an inverse ratio to the size of the individual flower. Then, again, "flowering" trees and shrubs bearing inflorescences do not necessarily make a greater display than ones with solitarily borne flowers, *e.g.*, Magnolias and Peonies when in bloom are quite as showy as Horse-chestnuts and Rhododendrons. The largeness of the individual flower in the one case makes up for the cluster of flowers in the other.

Another reason might be advanced for the evolution of the inflorescence. Pollination by insect visitors is facilitated by the grouping together of flowers into clusters. A bee, for example, could visit at a quicker rate a number of flowers clustered together than if they were scattered singly.

The foregoing may be the reason for the evolution of inflorescences to some extent, but the chief advantage accruing to the plant, to my mind, in the substitution of inflorescences for solitary flowers, is to be sought for in the old adage, "Do not put all your eggs into one basket." A shoot has at its disposal a certain amount of reproductive material. It may expend all this

in the production of a single flower of many parts. An injury to this flower may result in the total loss of seed production by this shoot. On the other hand, if it utilises this material in the formation of several flowers of fewer parts each, blooming successively as is the manner of inflorescences, the chances of an injury destroying the whole reproductive capacity of the shoot are minimised, as some of the flowers may escape and so set seed. The capability of the floral part of a shoot to branch, thus producing lateral flowers in addition to the terminal one, gives the plant an advantage. It lessens its risks.

The above remarks may not apply to intercalary inflorescences. The bunching together of flowers in this type of grouping may, on the contrary, have been evolved to render the flowers more evident to insects or to facilitate their visits. This is suggested by the fact that the intercalary inflorescence seems to have arisen, not so much from the splitting up as it were of one flower into several, but rather from the massing together of a number of solitary flowers through the suppression of the intervening foliage and the shortening of the internodes.

IV. The Solitary Terminal Flower, and the origin from it of the simplest Inflorescence—the Dichasium.

On general grounds it is reasonable to assume that flowers were originally borne in a solitary fashion, and that the clustering of them together without intervening foliage is a later development. Further, it would appear more likely that such solitary flowers were borne terminally to leafy shoots, rather than produced in an axillary manner. Assuming, then, that this is the primitive way in which flowers were borne, the question may be asked, Do plants still exist exhibiting this early mode of flower-bearing? Solitary terminal flowers are not uncommon, but we must be on our guard in assuming primitiveness in every case. Some may have arisen through the reduction of an inflorescence to a single flower. Each must be judged on its own merits. However, as will be shown later, the most conspicuous examples of solitary terminal flowers occur in those families—*e. g.*, the Magnoliaceæ, Ranunculaceæ, etc.—which on other grounds are now generally regarded as primitive. Reduction seems extremely unlikely here; at any rate, no evidence has been shown for it.

At this stage of the paper it may not be without interest to compare briefly the manner in which the "flowers" (strobili) are borne in the Gymnosperms, both recent and extinct. In doing so, we may leave on one side the study of the Cordaitean-Coniferous group, as it is but remotely connected with the Angiospermous line of descent, and confine ourselves to the Bennittitean-Cycadalean plexus, from which it is now generally assumed that the Angiosperms have sprung.

In the existing Cycads, all diœcious, the male and female sporophylls are each separately collected together into cones (stroboli), with one important exception, namely, the female sporophylls of the genus *Cycas* itself. These are borne loosely on the main axis. This continues to grow afterwards, producing successions of scale leaves, foliage leaves, and female sporophylls. This peculiarity, if one may so call it, of *Cycas* is of great interest, and may be regarded as the retention of an archaic feature possessed by its Pteridospermous ancestors, in which the sporophylls were borne loosely and not compacted into cones.

The cones of Cycads are usually borne solitarily; but occasionally they may occur in clusters on the apical part of the stem, *e. g.*, frequently in the case of the male cones of *Zamia*, and also in both kinds of cones of *Encephalartos* *. When solitary, there seems little doubt but that the cone is in a terminal position; a lateral bud near the apex then continues the vegetative growth, a sympodium being formed †. The cluster of cones borne laterally would appear to be a later development, and thus of no great evolutionary significance.

The strobilus, the homologue of the Angiospermous flower, has then, when occurring singly, a terminal position in the Cycads; at any rate, this would seem to be the primitive position. If one imagines a stem of *Cycas*, after it has emitted its first crop of female sporophylls, to cease further elongation, a terminal primitive strobilus ("flower") would result. Further vegetative growth would then be taken up by a lateral bud. It is a reasonable assumption to conclude that the male sporophylls of *Cycas* were originally borne in a similar fashion to the female ones. The cessation of the further growth of the main axis in times past has resulted in the production of a male cone or "flower." Hence the ancestor of the Cycads might be looked upon as having unlimited monopodial growth, bearing on its main stem successive crops of foliage leaves and sporophylls—in fact, a tree-fern-like form with pteridospermous features.

Taking into account the diœcious habit of the Cycads, and the form and arrangement of the female sporophylls of *Cycas*, it would seem that their cones must always have been monosporangiate. The unisexual nature of the strobilus cannot have arisen through reduction, but must have been due to the segregation of one kind of sporophyll into a cone from the Pteridospermous condition.

It must have been otherwise with the Bennittitean stock. In this group the stroboli contained, at least in many forms, both male and female sporophylls arranged in a definite manner the one to the other, viz. the

* Pearson, H. H. W., "Notes on South African Cycads.—I.," Trans. S. African Phil. Soc. xvi. (1906) p. 341.

† Solms-Laubach, Graf zu, Bot. Zeit. xlviii. (1890) p. 177.

female sporophylls above the male. In this case it may be assumed that in the Pteridospermous ancestor a crop of male sporophylls was immediately followed by one of female sporophylls, without intervening foliage; on the axis ceasing to lengthen, there would be formed a bisexual strobilus of a special character, to which the name *anthostrobilus* * has been given, as it foreshadows the angiospermous hermaphrodite flower, in which the carpels are always situated above the stamens on the floral axis.

This peculiarity in common is one of the facts, among several others, which make the origin of the Angiosperms from a stock *near* the Bennittitales distinctly plausible. Hence an examination of the manner in which the anthostrobilus of this group is borne becomes of interest. The best-known members of this fossil group, however, do not afford evidence for the primitiveness of the solitary terminal flower, since the strobili are borne in an axillary fashion. It may be suggested that *Bennittites* is much modified in its vegetative parts, and that its sessile strobili, occurring laterally on a short stout stem, have been derived from ones borne in a lax manner on slender stems. *Williamsonia* and the recently-described genus, *Wielandiella*, are cases in point. They had comparatively thin branching stems, upon which the cones appeared in a terminal position. Hence it would seem highly probable that the cones of the Bennittitales were primitively borne terminally, and that the lateral position has arisen through a great change in vegetative habit.

The Gnetales deserve a passing remark. Here the flowers or strobili, much reduced, are by no means solitary, but clustered together in complex inflorescences. Recent research † suggests, in addition to Angiospermous, Bennittitean affinities as well. The hypothetical group, the Hemiangiosperms ‡, introduced to contain those supposed plants related to the Bennittitales from which the Angiosperms are imagined to have arisen, has been considered to include the Gnetales §. On this assumption, the Gnetales, in regard to their flower-clusters and to the reduction in the individual flower itself, coupled with diclinism, may be looked upon as bearing a somewhat similar connection to the Hemiangiosperms as the Amentaceous families do to the Angiosperms as a whole. They are, as it were, the Amentiferæ of the Hemiangiospermeæ, and their complicated

* Arber & Parkin, "On the Origin of Angiosperms," Journ. Linn. Soc., Bot. xxxviii. (1907) p. 37.

† Sykes, M. G., "The Anatomy and Morphology of the Leaves and Inflorescences of *Welwitschia mirabilis*," Phil. Trans. Roy. Soc. London, 1910; Thoday (Sykes) & Berridge, "The Anatomy and Morphology of the Inflorescences and Flowers of *Ephedra*," Ann. Bot. xxvi. 1912, p. 953.

‡ Arber & Parkin, *loc. cit.* p. 62.

§ Arber & Parkin, "The Relationship of the Angiosperms to the Gnetales," Annals of Botany, xxii. (1908) p. 489.

inflorescences are just as derived as we believe those of the Amentaceæ to be.

A review of the Cycadean Gymnosperms, past and present, appears, then, to help us little in understanding and tracing the evolution of Angiospermous flower-clusters. If the solitary terminal strobilus be primitive, then many Gymnospermous genera have departed widely from this condition ; but this is not surprising. Evolution tends to progress along the least specialised line, this remaining the most plastic. Side lines are continually being given off, which rapidly end blindly in the production of highly specialised forms, often foreshadowing features which will appear later in a higher group evolved, as it were, on the main line. Hence in some Gymnospermous side lines the strobili (flowers) may have become clustered together or relegated from a terminal to an axillary position, but the main line of descent has clung to the solitary terminal cone, from which ultimately the solitary terminal angiospermous flower has arisen ; and these, in their turn, become grouped together or placed in the axils of leaves, thus producing the many arrangements of inflorescence to be seen among Flowering Plants at the present time.

The manner of evolution of the strobilus, and that of the anthostrobilus in particular, from the Pteridospermous mode of sporophyll grouping, would appear easier of comprehension on the assumption of the primitive nature of the solitary terminal strobilus, rather than on that of an axillary one or of a cluster.

The evolutionary advancement of sporophyll segregation may be considered to have taken place in the following order :—

(1) The production of a number of sporophylls on the main axis apart from the foliage. This may be considered to have occurred in the Pteridospermeæ.

(2) The formation of a strobilus through the main axis, after producing a number of sporophylls, ceasing to grow. This has occurred in the Cycads, with the exception of the female forms of the genus *Cycas* ; also in the Bennittitales with the formation of a special amphisporangiate cone, the anthostrobilus.

(3) The next step is the formation of clusters of cones or flowers—inflorescences, in fact. Though such aggregates do occur in Gymnosperms, they reach their great development and diversity in the Angiosperms.

(4) The latter group show a segregation of sporophylls of a still higher character—viz , the compounding of inflorescences, *e. g.* in the Compositæ, notably the genus *Echinops*.

After this digression, let us now turn to the consideration of the solitary terminal flower in the Dicotyledons. Before doing so, it may be well to be clear as to the meaning here attached to the conception of a terminal flower.

It has been stated that such flowers are extremely rare; but the writer in question limits the definition to plants in which the plumular (seedling) axis ends in a flower. Kerner *, for example, so defines the terminal flower, declaring it to be a rare occurrence found in a few annuals, e. g. *Papaver*.

In this paper the word "terminal" is applied to a flower which is produced at the end of a leafy shoot, no matter whether such a foliar shoot be the primary (plumular) axis or one formed later by branching. Both Van Tieghem † and Bentham ‡ allow this wider definition.

When flowers are borne terminally and singly, then theoretically the plumular axis should eventually end in a flower. It may be prevented from doing so through the apex of the shoot becoming arrested in its growth before the plant is in a condition to flower. In this case the first bloom will appear, not on the main axis, but on the top of a subordinate leafy shoot.

Annuals may generally be considered to have sprung from perennials. The vegetative period becomes shortened, and the flowering thereby hastened. Hence, in such annuals which may be regarded as having sprung from perennials with solitary terminal flowers, it is not surprising to find the plumular axis ending in a flower. This may have occurred in the perennial ancestor, but would not be so obvious, as the first flower would be longer in appearing.

In shrubs and trees of temperate regions, in which the production of flowers does not occur at least during the first summer of the plant's life, the upper immature part of the plumular axis will be killed by frost in the winter in those forms in which the shoots continue growing all the season; the main stem the next season will then be continued by an axillary bud. An advancement on the above is shown in many temperate trees and shrubs by the plant itself arresting the shoot's growth in the early summer and forming a bud in an apical position, which is destined to continue the main axis the following season. This bud may be a truly terminal, or a lateral one produced in the axil of the uppermost foliage-leaf—a common occurrence. If the former condition prevails till the flowering stage is reached, then in those trees and shrubs with solitary terminal flowers, the first flower will end the plumular axis. In the latter condition this can never occur, for the

* Kerner, A., 'The Natural History of Plants,' London, ed. F. W. Oliver, vol. i. (1894) pp. 640–641.

† Tieghem, P. E. L. van, 'Traité de Botanique,' 2nd edit. 1891, p. 341.

‡ Bentham, 'Handbook of the British Flora,' 6th edit., by J. D. Hooker, 1892, pp. xxii & xxiv.

growth of the plumular shoot is arrested before the flowering stage is attained. The first flower will then terminate a subordinate shoot, though it may appear as if it crowned the main primary stem on account of the formation of a sympodium.

In herbaceous perennials of temperate climates (with solitary terminal flowers) which do not bloom during the first season of the plant's activity, the earliest flower produced cannot terminate the plumular axis, for this will have died down completely at the end of the first season ; it must therefore be borne by a subordinate shoot.

The earliest mode of flowering would seem, then, to be that in which the first flower produced terminated the primary (plumular) axis of the plant, and later flowers appeared at the ends of subordinate leafy axes. Among annuals, cases are not uncommon now. Unmistakable flowers terminal to the plumular axis have come to my notice in species of *Nigella* and of *Papaver* ; also in *Adonis autumnalis*, *Saponaria calabrica*, and *Silene pendula*. By further observation there is little doubt but that the list could be greatly extended. Shrubs, trees, and herbaceous perennials with solitary terminal flowers require close watching from the seedling stage onwards to see if the primary axis, barring accidental damage, eventually ends in a flower. Tropical plants would serve better for this study, as the growing tips of the shoots are not subjected to winter frosts.

Turning now to solitary terminal flowers in the wider sense, instances are numerous, and particularly so in those families which are now generally recognised as containing a large number of primitive features in their floral parts, *e. g.*, Magnoliaceæ, Calycanthaceæ, Ranunculaceæ, Papaveraceæ, and Rosaceæ. These families are not only interesting in affording examples of forms with solitary terminal flowers, but also in revealing how the simplest flower-cluster—the dichasium—arises from the single apically-borne flower. It will be expedient, then, to treat of the origin of the simple dichasium, along with the detailed study of some of the genera containing examples of the solitary terminal flower.

MAGNOLIACEÆ.

Magnolia.—This interesting genus is especially characterised by its large solitary terminal flowers. As regards the number of foliage leaves on the flower-bearing shoot, the species examined by the author permit themselves to be arranged roughly into three groups :—

(1) Several foliage leaves on the flowering shoot. The flower expands after the foliage is mature. Evergreen and summer-flowering species. *M. grandiflora* and probably *M. Delavayi*, judging from figures and descriptions.

(2) One or two foliage leaves, which mature after the flower. Spring bloomers. Deciduous. *M. Yulan*, *M. parviflora*, *M. stellata.*

(3) No foliage leaves on the short flower-bearing shoot. *M. obovata*, *M. glauca.*

As regards the relative primitiveness of the above four modes, there would seem to be little doubt but that the first represents the least-evolved flowering shoot. From it the second has arisen through the tendency to differentiate the flower-bearing shoots from the purely vegetative ones, induced probably by hastening the time of flowering and by the adoption of the deciduous habit. The third mode follows on as a more extreme case of the second.

As far as the writer is aware, axillary flowers do not occur in *Magnolia*, but they become the rule for the closely allied genus *Michelia*. In a later section of this paper it will be shown how such axillary flowers can be derived from solitary terminal ones.

Liriodendron Tulipifera bears its flowers in a similar fashion to *Magnolia grandiflora*. It is, however, not evergreen but deciduous.

Illicium, *Schizandra*, and *Kadsura* have axillary flowers, while *Drimys* possesses an inflorescence of the intercalary type, to be treated of later.

Zygogynum, a monotype of New Caledonia, is interesting in having a solitary terminal flower ; otherwise it is related to *Drimys.*

Hence in the family Magnoliaceæ we meet with solitary terminal flowers in *Magnolia*, *Liriodendron*, and *Zygogynum* ; with solitary axillary flowers in *Michelia*, *Illicium*, *Schizandra*, and *Kadsura* ; and with intercalary inflorescences in *Drimys*. No examples have come to my notice of the simple dichasium arising from the solitary terminal flower. On turning, however, to the somewhat allied family, the Calycanthaceæ, this is to be seen.

CALYCANTHACEÆ.

Calycanthus.—In two species examined of this genus, viz. *C. floridus* and *C. occidentalis*, the flowers are usually borne single and terminal to short leafy shoots (fig. 1, A).

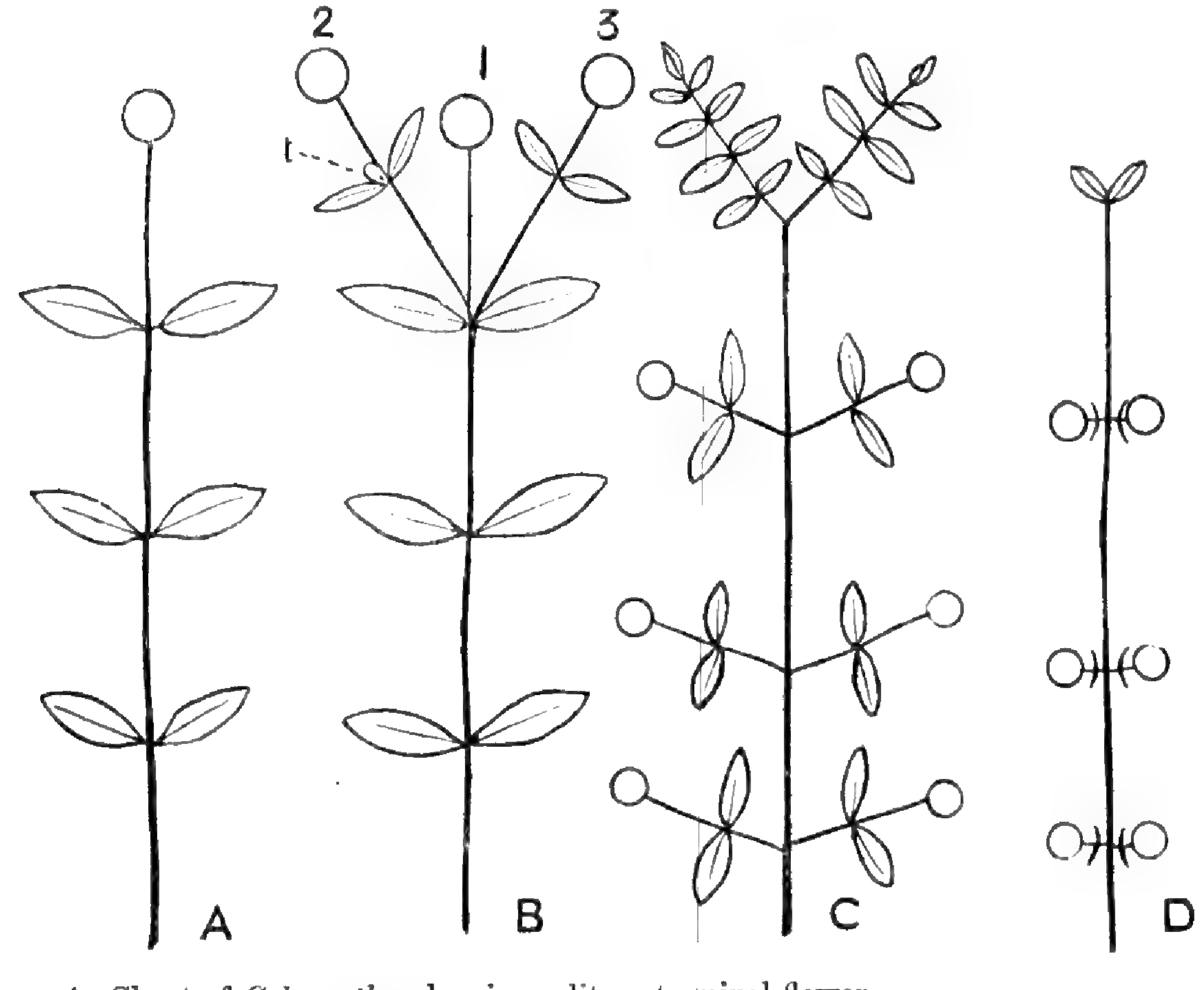
In the case of *C. occidentalis* lateral floral shoots are produced sometimes from the axils of the uppermost pair of foliage leaves, the three flowers (the terminal and the two laterals) thus forming a simple dichasial cyme (fig. 1, B). The terminal flower blooms first, and the laterals expand later. These secondary floral shoots produce, as a rule, only a pair of foliar organs, which may be reduced to bracts. In one instance a tertiary flower-bud was noticed in the axil of one of these bracts, thus revealing a tendency towards the branching dichasium so common in early forms of inflorescence.

Calycanthus floridus sometimes shows a variation in the mode of bearing its flowers. Instead of the uppermost pair of shoots on a main branch ending in flowers, these continue vegetatively, and the flowers appear on short lateral

shoots lower down the branch (fig. 1, C). Each bears only a pair of foliage leaves before the apical flower. This is an interesting case of the tendency to transfer the flowering to the lower or lateral shoots, reserving the upper or main shoots for vegetative expansion.

Chimonanthus fragrans.—The less usual mode of flowering in *Calycanthus floridus*, just described, suggests the way in which the manner of flower-bearing shown in this monotypic genus may have arisen. This deciduous

Fig. 1.

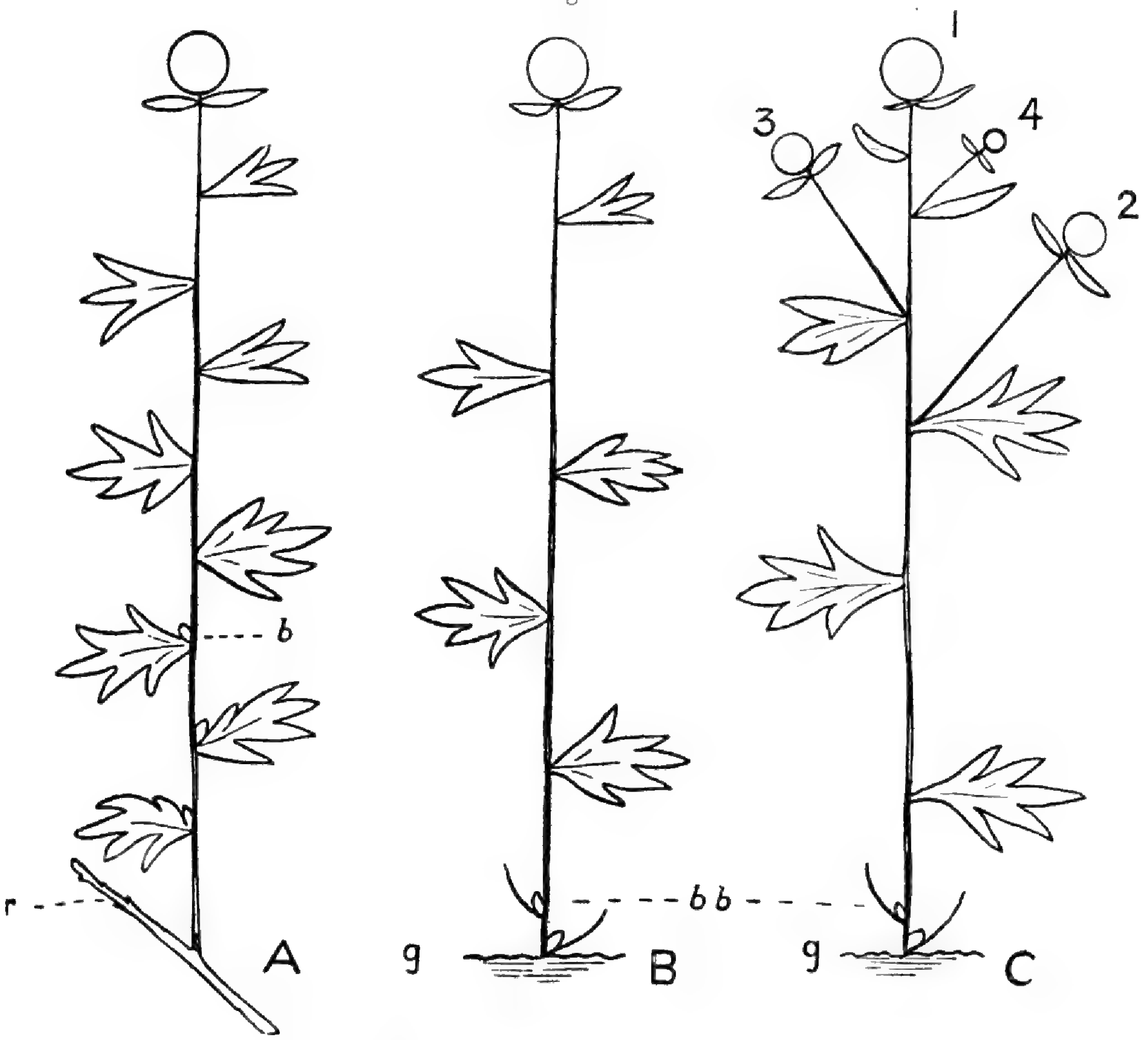


A. Shoot of *Calycanthus*, bearing solitary terminal flower.
B. Shoot of *C. occidentalis*, bearing a simple inflorescence of three flowers. *t*, bud of a tertiary floral axis.
C. Main branch of *C. floridus*, bearing several short subordinate leafy shoots ending in solitary flowers, and above a pair of vegetative shoots.
D. Flowering branch of *Chimonanthus*, showing sessile single flowers without foliage and ending above in a pair of vegetative buds.

shrub produces its flowers before the leaves. They are borne in sessile fashion and singly in the axils of last summer's foliage leaves; that is, they appear just above the leaf-scars on the previous year's shoot (fig. 1, D). Each flower has below its perianth a number of bracts, but no foliage leaves are produced on this short axis. The flower then is really axillary, except that it appears after the foliage leaf subtending the axil has fallen. In fig. 1, C, imagine the floral shoots to be divested of their foliage leaves, the internodes

suppressed, and the flowering to take place early in the year before the foliage appears: a condition resembling *Chimonanthus* would then ensue. *Calycanthus* may be regarded as resembling closely the ancestor of *Chimonanthus.*

Fig. 2.



A. Shoot of *Pæonia Moutan* ending in a solitary terminal flower. *b.* Buds in axils of lower foliage leaves, which will produce shoots the following year. The part above the uppermost bud depicted will die away. *r.* Remains of the upper part of the previous year's flowering shoot.
B. Shoot of *Pæonia officinalis* ending in a solitary terminal flower.
C. Shoot of *Pæonia albiflora* ending in a group of four flowers. (A simple form of inflorescence.)

g. Ground-level. *b b.* Buds in axils of basal scale-leaves, the whole or the shoot above dying down at the end of the summer.

Ranunculaceæ.

Pæonia.—This is a distinctly interesting genus for observing the initial stage in the evolution of an inflorescence. All the species except four (*P. albiflora*, *P. lutea*, *P. anomala*, *P. Veitchii*) appear to have solitary

erminal flowers (fig. 2, A & B). These latter may have, besides the terminal flower, two or three lateral ones, the whole thus forming a rudimentary inflorescence (fig. 2, C).

In *P. Moutan*, the only arborescent member of the genus, the flowering shoot possesses several foliage leaves. The lower ones only produce buds in their axils (fig. 2, A). As winter approaches, the shoot dies back as far as the uppermost foliage leaf, which bears a bud in its axil. In the following spring these buds, produced in the axils of the lower foliage leaves, lengthen as shoots, most of them ending in solitary flowers.

Turning to the herbaceous species—*e. g.*, the common *P. officinalis*,—the leafy shoots which appear above ground in the spring each produce first a number of foliage leaves, and then the solitary terminal flower. No buds occur in the axils of these leaves (fig. 2, B). The whole dies down in the autumn. Next season's aerial growth is produced from buds in the axils of the basal scale-leaves. The foliar shoot, then, of the herbaceous Peony would appear to be equivalent only to the upper part of the shoot of *P. Moutan*. The lower foliage leaves of the latter—the ones producing buds in their axils—may be regarded as reduced to basal scale-leaves in the former.

The Tree Peony may be considered the older representative of the genus. The herbaceous forms of *Pæonia* have probably been derived from the arborescent type* through, as it were, downward compression, whereby the vegetative branching takes place wholly at or below the ground-level.

Let us now examine the features of the floral part of the shoot in those few species of *Pæonia* which bear more than one flower. *P. albiflora* will serve for our study, its associates resembling it closely in this respect. Its vegetative features are similar to those which have been described for *P. officinalis*, but all the foliar axils on a shoot are not always barren of buds. Two, three, or four of the upper ones may produce buds, which lengthen into lateral floral shoots, each bearing an apical flower, which blooms after the terminal one of the main shoot. These secondary floral shoots bear each a pair of reduced leaves (fig. 2, C).

It is hardly to be disputed that *P. Moutan* and *P. officinalis* represent an earlier mode of flowering than that of *P. albiflora* and its associates. In the former there are no signs of buds in the axils of the upper foliage leaves. If the single terminal flower had arisen through reduction, then arrested buds might be expected to occur in these axils, or some other vestigial structure to be present suggesting former flowers. The production of flower-buds in the upper part of the shoot of *P. albiflora* and its allies may therefore be regarded as a new feature in the genus—in fact, the initial stage towards the formation of a distinct inflorescence. These buds are a new addition—organs, in fact, arising *de novo*. The reproductive material, which in the

* That the arborescent habit has in general preceded the herbaceous in the course of evolution, is a view the writer has held for some time.

other species is expended in the shaping of a single flower for each shoot, is here split up, as it were, and utilised for the formation of three or more flowers.

Trollius, *Nigella*, and *Adonis*.—These three herbaceous genera may be grouped together in regard to the manner in which their flowers are borne. In each case the lateral floral shoots, when produced, bear usually more than two leaf-structures. The number is somewhat indefinite, and their size (foliaceous character) decreases from below upwards, which is usually the case in feebly defined inflorescences. Foliage leaves and bracts hence merge into one another.

Another feature these three genera have in common is that the secondary floral shoots do not arise from the uppermost leaves of the main axis; the three top axils remain barren as a rule.

In *Trollius europæus* the floral branching is feeble and not carried beyond the secondary degree. The commonest case consists of the terminal flower and two or three laterals. *Trollius* would appear to have just departed from the condition of the solitary terminal flower.

Adonis autumnale carries the floral branching a degree or two farther by producing, besides more secondary branches, tertiary floral shoots to some extent.

Nigella—a genus wholly composed of annuals; the floral branching is still greater, shoots to the fourth degree being produced.

It is interesting to note that in *Adonis autumnalis* and all species of *Nigella*, being annuals, the plumular axis must, barring accidents, end in a flower. This is invariably the first one to open.

Ranunculus.—In this, the representative genus of the family, a more definite type of the lax dichasial inflorescence has been evolved than in the foregoing. *Ranunculus acris* and *R. aconitifolius* afford good examples of repeated dichasial branching, floral shoots to the fifth degree being often produced. Of secondary shoots, however, more than two—three to six, in fact, are formed. Afterwards the branching is strictly dichasial, each shoot being composed of the terminal flower and a pair of bracteoles.

Unlike *Trollius*, *Adonis*, and *Nigella*, the uppermost leaves (bracts) of *Ranunculus* produce from their axils secondary flower shoots.

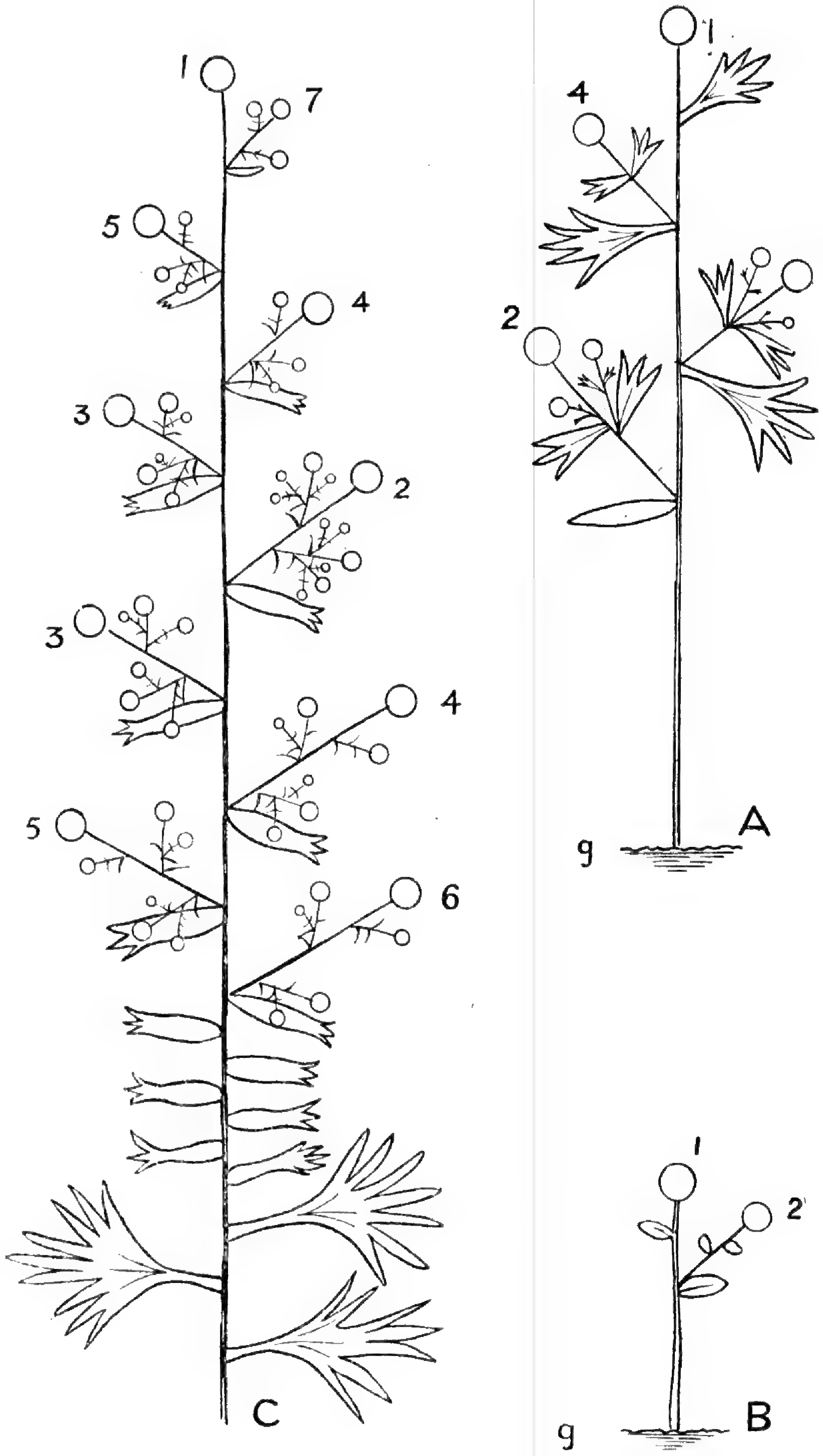
Helleborus.—Solitary terminal flowers recognised as primitive can hardly be said to exist in this genus, but some species come very near to possessing them. Three main types of flower-arrangement can be recognised in the genus:—

A. Inflorescence feebly differentiated, very lax and of few flowers. The majority of the species, e. g., *H. viridis* (fig. 3, A), *H. orientalis*.

B. Flowers solitary or in pairs: *H. niger* (fig. 3, B).

C. Inflorescence more defined, panicled, and of many flowers: *H. fœtidus* (fig. 3, C), *H. lividus*.

Fig 3.



A. Flowering shoot (inflorescence) of *Helleborus viridis*, a leafy trichasium with some tertiary floral branching.

B. Flowering shoot (inflorescence) of *Helleborus niger*, consisting merely of terminal and one lateral flower; no foliage, only bracts. *g*. Ground-level.

C. Inflorescence of *Helleborus fœtidus*, a pleiochasium with di- and trichasial branching Note non-foliar character of the bracts.

Church, in his treatment of the genus *, regards type C, that of *H. fœtidus*, as the most primitive, then A as intermediate, and finally B as the most evolved, basing his ideas on the progressive reduction in the number of flowers. This view does not wholly commend itself to me, for the following reasons. In type A the bracts are very foliaceous, making the inflorescence ill defined. In the other two types the bracts are more reduced and the flower or flower-clusters more sharply marked off from the foliage. The flower-arrangement in a species like *H. viridis* appears to me as perhaps the least evolved in the genus. It has, besides the terminal flower, two or three laterals; tertiary floral branching takes place, to some extent, as well. The bracts are very leaf-like. Forms like *H. torquatus*, hort., and *H. cyclophyllus* may be still more primitive, as they produce only two secondary floral axes and no tertiary ones; or they may represent the first stage in reduction towards *H. niger*, for I regard the solitary or twin flowers in this latter species as due to reduction from a three-flower cluster, and so far am in agreement with Dr. Church. The non-foliaceous bracts in *H. niger* and the character of the second flower when present, suggest some reduction rather than primitiveness.

In type A, the *viridis*-group of species, the true foliage leaves are all radical. The shoot which appears above the ground may then be regarded as the inflorescence, the bracts of which still largely retain the form and colour of foliage leaves. In *H. niger* the geophytic condition is still more accentuated. The inflorescence is much less elevated and the bracts have wholly lost their foliar character.

The habit of *H. fœtidus* and its allies is quite different. These plants are caulescent—in fact, dwarf evergreen shrubs. The foliage leaves are wholly cauline. These species, exhibiting arborescence, have probably retained the more primitive vegetative habit of the genus, the geophytic condition in the other members of the genus being derived from it (cf. *Pæonia Moutan* with the other species of the genus). But in regard to the inflorescence of *H. fœtidus*, this would seem to be a considerable advancement on a form like that shown by *H. viridis*.

An inflorescence like that of *H. fœtidus* can be derived from one resembling *H. viridis* by increasing the number of secondary floral branches, by continuing the branching of these latter to a higher degree, and by reducing the foliaceous character of the bracts. The inflorescence of *H. fœtidus* may have nine lateral axes, and the branching may be carried to the fifth degree. The lower secondary axes branch trichasially and the upper dichasially. The higher branching in both cases is dichasial, each axis bearing a couple of bracteoles. The terminal flower of the main axis is the first to expand, then it was noticed that the end flower of the

* Church, A. H., 'Types of Floral Mechanism,' Oxford, 1908, pp. 10–13.

fifth secondary axis was the next to open. The expansion is then continued from this point somewhat acropetalously and basipetalously simultaneously.

Before dismissing the family Ranunculaceæ, the genus *Anemone* calls for some remarks.

Anemone.—At first sight one might be inclined to consider this genus as affording examples of the primitive solitary terminal flower. Many species bear their flowers singly, but when this is the case the plant possesses the geophytic habit, and when the latter occurs one has to be on one's guard, as geophytes have undergone in their evolution much compression in their vegetative features, and this may have taken place *pari passu* with a reduction in the number of flowers composing the original inflorescence. This will be more likely to have happened in those instances in which the immediate ancestors of the geophytes had loose ill-defined flower-groupings. The genus *Anemone* appears to be a case in point. Then the involucre—a special feature of this genus—is most modified in the single flowered species, which would hardly be the case if such forms were primitive with respect to their solitary flowers.

A species like *A. japonica* affords a convenient starting-point for the evolutionary study of the mode of flower-bearing in the genus.

A. japonica.—The foliage leaves proper are radical. The whole of the upright aerial shoot may be considered an inflorescence of a very lax ill-defined kind. The main axis terminates in a flower which is the first to bloom, and bears three leaves, little removed in character from the foliage leaves. These foliar organs practically form a whorl and make, in fact, the involucre—a marked feature of the genus. It is easy, however, to see that the three leaves composing the involucre really proceed from the stem at different levels; in fact, there is little doubt that the involucre is formed by the suppression of two internodes, and that originally the leaves were borne in a scattered manner, as they are on the main axis of the inflorescence of *Ranunculus*.

From the axil of each of these involucral leaves proceeds a secondary floral shoot similar to the main axis, except that it bears only two leaf-structures. From these, tertiary shoots are produced of a like character, and the branching may be continued to some extent to even a higher degree. It is to be noted that the secondary floral shoots do not bloom simultaneously but in acropetalous order, and their branching likewise develops similarly; consequently the lowest secondary shoot produces most flowers or flower-buds in the season.

Similar inflorescences occur in *Anemone caroliniana*, *A. cylindrica*, *A. baldensis*, and *A. pennsylvanica*, with this difference that the branching is not carried so far.

In *A. narcissiflora* a number (five is very usual) of flowers proceed from the many-leaved involucre—the whole forming a false umbel—the so-called

simple cyme. The flowers or flower-buds exceed by one the number of leaves in the involucre; that is to say, the inflorescence consists of a terminal flower—the first to bloom—and lateral flowers, each proceeding from the axil of one of the involucral leaves.

This inflorescence is somewhat intermediate between the foregoing and the single-flowered forms of *Anemone*, but at the same time it is somewhat specialised and apart.

In *A. ranunculoides* the last step but one to the complete reduction of the inflorescence to a single flower is reached. This species, besides the terminal flower, sometimes produces a lateral one with a pair of bracteoles, and so is twin-flowered.

The Pulsatilla section of the genus (*A. Pulsatilla, A. vernalis*, etc.) is probably the most evolved; besides having solitary flowers, the involucre is much modified, being close up to the flower, thus resembling a calyx. The involucre of *A. Hepatica* is still more calyx-like, but this species, as regards its flower-arrangement, is quite apart, and probably there is some warrant for keeping it as a separate genus, as was done by earlier systematists.

PAPAVERACEÆ.

This is a distinctly useful family for showing the gradual progression from solitary terminal flowers to racemose inflorescences. This natural order is mostly composed of herbs. A few species have retained a shrubby habit. Marked arborescent forms are absent.

The monotypic shrubby genus, *Dendromecon*, has solitary terminal flowers, suggesting that the progenitors of this very natural family bore their flowers in a similar fashion and had an arborescent habit.

Three other monotypic herbaceous genera, *Romneya*, *Hunnemannia*, and *Sanguinaria*, have solitary flowers, which are probably primitively terminal.

Papaver.—In this large genus the initial stage in the building of flower-clusters can be followed.

Papaver orientale and *P. bracteatum* are species with solitary terminal flowers. The cauline foliage leaves, 5–7 in number, have no buds in their axils. The leafy shoot which arises from the perennial rootstock, and which ends in a single large flower, is thus comparable to that of the herbaceous Peony (*Pæonia officinalis* and allies, see p. 530).

Papaver Rhœas, the common poppy of the British Isles, and *P. somniferum*, the opium poppy, both annuals, produce, besides the flower terminal to the main (plumular) axis, several subordinate shoots ending in flowers. The branching may be carried to the fifth degree, at least in *P. Rhœas* (cf. *Ranunculus acris*, p. 531). The inflorescence, however, is ill-defined, being very lax, and the foliar organs largely retaining their foliaceous character. *Papaver strictum* shows some advance on the above. Besides

the terminal flower, which blooms first, six to nine laterals are produced ending in flowers. The upper secondary axes are devoid of bracteoles; the lower ones possess them and flower-buds in their axils as well.

Papaver pilosum and *P. spicatum* have their flower-clusters still more defined and compact.

Meconopsis, the next largest genus to *Papaver*, shows in its species a somewhat similar evolution of a fairly definite inflorescence from the solitary terminal flower, or from a condition once removed from this.

ROSACEÆ.

This large family is probably one of the more primitive or, at any rate, one showing primitive features, among the higher Polypetalæ. Well-defined inflorescences are not very common; and where dense ones occur, they can often be connected in the same or in an allied genus with simpler, more diffuse types of flower-clusters, and sometimes even traced back to the solitary terminal flower.

In the first place, we may turn our attention to three nearly related genera, *Kerria*, *Rhodotypos*, and *Neviusia*, which stand somewhat apart in the family and which probably are among the more primitive members. These genera are monotypic; two confined to the Chino-Japanese region and one to Atlantic North America, a not unusual discontinuous geographical distribution for old and waning types, e.g., *Liriodendron*, Calycanthaceæ, *Hydrastis*.

Kerria japonica.—The form with double flowers is commonly grown in our gardens, and my observations have been made on this. It has usually solitary terminal flowers. Sometimes these are situated at the ends of very long leafy shoots. As many as thirty foliage leaves have been counted on such a shoot terminated by a solitary flower. These long shoots arise from the base of the plant; commencing in the spring, they continue to grow all the summer, and end their growth with a flower in the early autumn. Occasionally two or three lateral flowers appear alongside the terminal one; these arise from the uppermost leaf axils and each pedicel bears two bracteoles. Thus a feeble attempt at an inflorescence.

Besides this late summer or early autumn flowering, a much greater mass of bloom is produced in the late spring or early summer. These flowers appear in solitary fashion at the end of short leafy shoots which arise from the axils of the leaves (now fallen) on the long basal shoots produced the previous summer. The foliage leaves on these short lateral flower-bearing shoots number three to four, sometimes six to seven. The uppermost leaf is often much reduced in size.

This plant would seem to be tending towards being a spring or early summer bloomer only. The production of solitary flowers at the ends of the

long summer shoots may be looked upon as a surviving habit of a former state, when the plant was a somewhat continuous flowerer and a dweller in a warmer climate.

Rhodotypos kerrioides bears its solitary flowers somewhat similarly to the foregoing genus.

Neviusia alabamensis has a simple form of inflorescence composed of a terminal flower the first to bloom and a few lateral flowers, each borne in the axil of a foliage leaf. The pedicels bear no bracteoles.

It is interesting to note that in this genus an inflorescence is associated with an apetalous flower. The other two genera have marked corollas and solitary flowers.

Rubus.—The gradual evolution of somewhat dense cymose inflorescences from the solitary terminal flower can be followed in this genus.

Large solitary terminal flowers have been noted in *R. deliciosus*, a shrubby species. On the flowering shoot full-sized foliage leaves occur right up to where the long flower-stalk commences. In this instance there would seem to be no grounds for supposing that the single flower is a reduced inflorescence. In fact, the lack of bracts suggests strongly that this solitary terminal flower is primitive.

Rubus palmatus has its flowers either terminal and solitary, or disposed in a simple dichasium, with a pair of bracteoles to each of the two lateral floral shoots.

Rubus phœnicolasius has a terminal flower and three laterals, and each of these branches dichasially producing tertiary flowers.

The lax inflorescence of *R. odoratus* branches still further, producing flowers to the fourth degree.

Finally, *R. fruticosus*, the common bramble of the British Isles, has a more compact and floriferous inflorescence. Several lateral floral shoots are emitted, six or seven are common; these branch somewhat dichasially. The terminal flower is the first to bloom.

Rosa.—The gradual building up of a branched cymose inflorescence from the solitary terminal flower can be traced in this genus.

Rosa spinosissima of our western coasts has solitary flowers terminating short leafy shoots. The leaf next to the flower retains its foliaceous character and is hardly reduced in size, thus comparable to *Rubus deliciosus* in the preceding genus. *Rosa altaica*, *R. sericea*, *R. Hugonis*, etc., bear their flowers similarly.

Several species have been noted which may produce a cluster of three or four flowers or only the terminal one. *R. canina*, the common rose of our hedgerows, is a case in point. Sometimes the shoot ends in a solitary flower with the uppermost leaf foliaceous. More frequently lateral floral shoots are emitted from the axils of the two upper leaves, which are reduced in size, the upper one being merely a stipular bract. The secondary shoots

each terminates in a flower and bears a pair of bracteoles, which may have buds in their axils, thus showing a tendency to branch further.

Rosa indica is an example of a more branched inflorescence, leading to the many flowered, copiously branched, somewhat compact clusters to be found in *R. sempervirens*, *R. multiflora*, etc.

Pyrus.—This is the last genus to be taken for the purpose of illustrating the origin of an inflorescence from the solitary terminal flower.

Pyrus Cydonia (the Quince) and *P. germanica* (the Medlar) supply instances of species with solitary terminal flowers. There are no reduced leaf-structures below the flower, the leaves remaining foliaceous right up to the flower-stalk.

From such species with solitary flowers, we can pass through ones like *P. japonica* and *P. Malus* with few-flowered unbranched cymes to forms like *P. Aucuparia* with many-flowered, branched cymose inflorescences.

V. The Evolution of Racemose Inflorescences from the Pleiochasium or Panicle.

In the preceding section of this paper it has been shown that the earliest form of flower-cluster is the di- (or tri-)chasium, a very simple cymose inflorescence, consisting of the terminal flower, which is the first to bloom, and of two (or three) lateral flowers. These latter terminate secondary axes which are borne in the axils of leaves (either foliar or bract-like in form), situated on the main axis just below the terminal flower. These secondary floral shoots bear, as a rule, a pair of reduced leaf-structures (bracteoles), which often produce in their axils tertiary flower-buds.

One common way of advancement from the above simple cluster consists in augmenting the number of secondary floral axes beyond three. The inflorescence then becomes a pleiochasium or multiparous cyme, with dichasial subordinate branching, as each secondary floral shoot usually branches so, producing tertiary flowers to some extent. Inflorescences of this type, when of a lax habit (long internodes), have often had applied to them the term *panicle*. In the genus *Helleborus* already studied (p. 533), *H. fœtidus* affords an example of a species with a panicle of this nature. Though it is many-flowered, yet the terminal flower of its main axis is the first to bloom. This genus does not allow us to continue further the study of the inflorescence along this line, as this is the furthest advancement to which apparently the genus has attained.

Two other genera, however, viz. *Delphinium* and *Aconitum* of the same family, the Ranunculaceæ, afford some scope for tracing the manner of transition from the cymose to the racemose type of inflorescence. It is interesting to note here that these two genera not only have the most evolved inflorescences in the family, but also the highest, most specialised, flowers.

The main points noted in the passage from cymose to racemose inflorescences in these genera are as follows :—

The number of lateral floral shoots increase, so that the main terminal flower no longer blooms first. The flowers then tend to open in acropetalous succession from the commencement. The next step comes about through the flower-buds of the uppermost part of the inflorescence never expanding; this part, in fact, becomes arrested in its development and finally aborts, leaving a mere filament or protuberance in its place. In this way the original terminal flower disappears. The inflorescence is now racemose.

Below, a few details are given regarding species exemplifying the above points. A more extended study of these two genera would probably reveal a greater number of examples of inflorescences between the pleiochasium and the true raceme or spike.

Delphinium cashmerianum has a quite lax, somewhat foliaceous, few-flowered inflorescence (a pleiochasium, in fact, with four secondary floral axes), the terminal flower of which is the first to bloom, the lateral flowers opening somewhat basipetally.

D. yunnanense and *garden forms of perennial Larkspurs* have racemose inflorescences, the aborted upper parts being merely represented by minute filaments or slight protuberances.

D. Consolida.—The inflorescence of this annual might seem at first sight to have a terminal flower, but the uppermost bloom is really lateral, proceeding from the axil of a bract and bearing on its pedicel the usual pair of bracteoles. The real apex of the inflorescence is almost obliterated, no filament or even protuberance occurring.

Aconitum anthoroideum has a raceme-like inflorescence with a terminal flower.

A. Anthora var. *racemosa.*—The uppermost part of the inflorescence is arrested in its growth, so no terminal flower expands.

A. Napellus and *A. Lycoctonum.*—The racemose spikes end in terminal filaments, which are the vestigial remains of the aborted uppermost parts of the inflorescences.

A. variegatum has a lax inflorescence, but no terminal flower, the axis ending in an elbow or slight protuberance. The individual flowers, however, do not open in a strictly acropetalous order, some of the upper ones expanding before the lower ones.

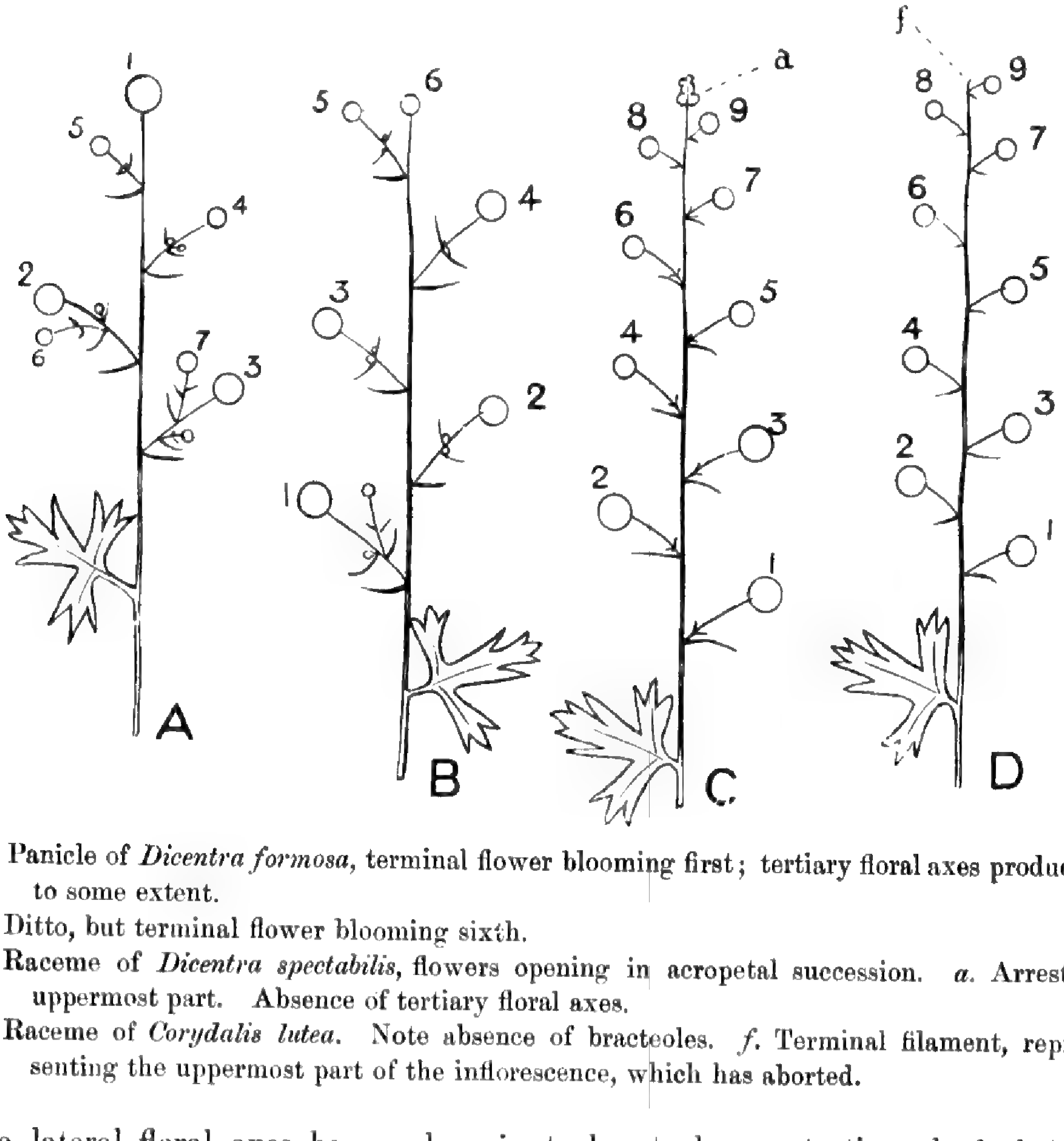
PAPAVERACEÆ.

As in the Ranunculaceæ, the genera with the most specialised flowers have also advanced inflorescences. The Fumarioideæ (sometimes recognised as a separate family, the Fumariaceæ) illustrate the passage from cymose to racemose inflorescences.

Dicentra formosa (fig. 4, A & B) possesses a pleiochasium of four or five lateral branches. The terminal flower is usually the first to bloom, occasionally the last; afterwards the order of the expansion is inclined to be acropetal. The lateral axes branch dichasially producing tertiary flowers to some extent, and even flower-buds to the fourth degree may be formed.

D. spectabilis (fig. 4, C) has a true raceme. The uppermost part of the inflorescence is occupied by a few rudimentary buds, which do not expand.

Fig. 4.



A. Panicle of *Dicentra formosa*, terminal flower blooming first; tertiary floral axes produced to some extent.

B. Ditto, but terminal flower blooming sixth.

C. Raceme of *Dicentra spectabilis*, flowers opening in acropetal succession. *a.* Arrested uppermost part. Absence of tertiary floral axes.

D. Raceme of *Corydalis lutea*. Note absence of bracteoles. *f.* Terminal filament, representing the uppermost part of the inflorescence, which has aborted.

The lateral floral axes bear only minute bracteoles, no tertiary buds being produced.

This inflorescence is therefore a considerable advance on that of the former species.

In *Corydalis lutea* (fig. 4, D) and other species of this genus the raceme is still more pronounced in that it ends in a minute filament, the remnant of the arrested apical part of the inflorescence, and the pedicels are naked, the bracteoles having been wholly suppressed.

Rosaceæ.

A few examples are to be noted in this family of cymose inflorescences with racemose tendencies, such as the ascending order of the blooming of the lateral flowers, and the delay in the expansion of the terminal flower, till after some of the laterals have opened.

Rubus fruticosus (the common bramble). In this species the terminal flower of the somewhat raceme-like inflorescence expands first, but the laterals open on the whole acropetally.

Cratægus Oxyacantha (the common hawthorn). The inflorescence is of the nature of a corymbose cyme—a pleiochasium with many tertiary flowers. The terminal flower varies as to the time of its expansion. It may be the first flower of the inflorescence to open, or its blooming may be deferred till later. The writer has noticed the terminal flower of these inflorescences opening third, fifth and sixth respectively, besides first. Though to some extent the delay in the expansion of the terminal flowers varies directly as the density (number of flower-buds) of the inflorescence, it is not always so. No very clear acropetal blooming of the laterals is to be noticed in this inflorescence.

Raphiolepis indica—a species of a genus allied to *Cratægus*—has a racemose cyme. The terminal flower opens first, but the laterals bloom in the ascending order as a rule. No tertiary flowers are produced, though each pedicel bears a pair of bracteoles.

Campanulaceæ.

The genus *Campanula* is of special interest, as it illustrates remarkably well the passage from a lax, cymose, panicled inflorescence to a definite racemose one, usually of the spicate type.

This genus from the above point of view would well bear a more extended study than the author has been able to give to it. Below only species are dealt with which have come under his personal examination.

(1) *Lax Di- or Trichasia.*

Campanula carpatica.—The cluster consists usually of a terminal flower and two laterals borne in the axils of bracts. The terminal is naturally the first to bloom, the two laterals expanding afterwards in the ascending order. Sometimes a fourth flower (a third lateral) issues from the axil of the uppermost foliage leaf. The laterals bear a pair of bracteoles each, but no tertiary flowers are produced.

The author is inclined to regard this mode of flower-bearing as one of the least evolved in the species directly examined by him. The inflorescence is little more than a simple dichasium. The large size of the individual flower

and the shallow nature of the corolla suggest primitive characters. On the other hand, the plant is somewhat of an alpine; and the possibility of reduction having taken place in the inflorescence, often correlated with an increase in size of the individual flower, is not to be wholly disregarded.

(2) *Lax panicles—the terminal flower first to bloom.*

The species coming under this heading differ from the foregoing in that the main axis branches more and to a higher degree, forming dichasially branched pleiochasia.

The common Bluebell of Britain (*C. rotundifolia*) may be taken as the type here (fig. 5, A). The terminal flower is the first to bloom and the lateral flowers, which may number as many as eight, then open in the ascending order for the most part. Each lateral produces from the axils of its bracteoles a pair of tertiary flowers, so the inflorescence becomes a dichasial pleiochasium.

C. patula may be mentioned as another example under this heading, likewise *C. isophylla.* Also to some extent *C. barbata, C. Portenschlagiana, C. primulæfolia, C. rhomboidalis*, and *C. Scheuchzeri*—the last two are without tertiary flowers.

(3) *Spicate forms—the terminal flower no longer blooming first.*

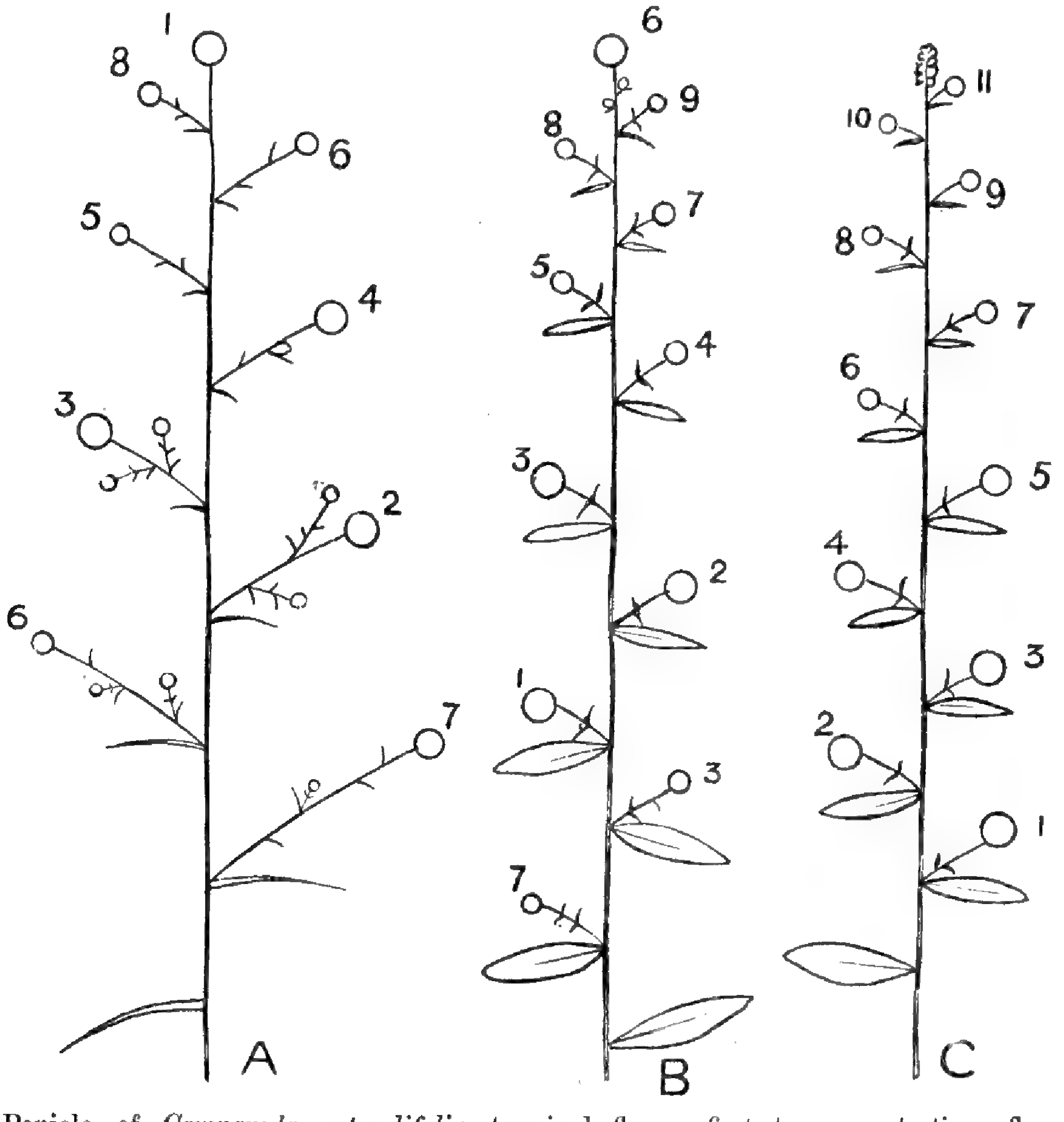
In *Campanula rapunculoides, C. latifolia*, and *C. spicata* the "spike" ends in a terminal flower, which, however, does not expand first (fig. 5, B). The flowers open in the ascending order for half to two-thirds of the way up the "spike," then the terminal flower expands and afterwards the upper (the remainder) bloom. The succession is by no means fixed. In long inflorescences the terminal flower-bud may be the last to open. Tertiary floral shoots are for the most part suppressed, though the paired bracteoles are present. There is a tendency, noticed in several examples, for the uppermost flower-buds to become arrested in their development, so that they never expand. In some specimens of *C. rapunculoides* (fig. 5, C) observed in Switzerland this had gone so far that no terminal flower-bud was evident; in fact, through the uppermost part of the inflorescence becoming arrested in its growth, a true racemose spike was produced, all the flower-buds expanding in acropetal succession. Further, in these Swiss examples the bracteoles were noticed to be absent (evidently aborted) in the upper flowers, though present in the lower ones. This species (*C. rapunculoides*) would repay a more extended investigation in different localities, from the point of view of the change from a cymose to a truly racemose type of inflorescence.

Besides the tracing of the evolution of the simple racemose spike from the cymose panicle, two other lines in the evolution of flower-clusters in this genus, *Campanula*, have been noticed.

(4) *Campanula pyramidalis.*

This species has a very long, moderately compact, many-flowered inflorescence ; and differs from those described in the foregoing group in that the tertiary flowers are not suppressed, but greatly developed in a regular

Fig. 5.



A. Panicle of *Campanula rotundifolia,* terminal flower first to open, tertiary flowers produced to some extent.

B. Racemose panicle of *C. rapunculoides,* terminal flower opening sixth. Tertiary axes largely suppressed.

C. Ditto, but panicle has become a true raceme with arrested uppermost part.

manner. The terminal flower-bud of the whole inflorescence is the last to open, or it may never expand at all—a result agreeing with the general view expressed in this paper that as the number of secondary floral shoots increase, so is delayed the blooming of the terminal flower, until it ceases to open at all and finally aborts.

(5) *Campanula garganica.*

The flower-arrangement in this species may be derived from one like *C. isophylla*, which shows very little foliar reduction in the leaves, which subtend the secondary flowers. By lengthening the main axis of the inflorescence and by increasing the number of laterals, a flower-arrangement like that in *C. garganica* is reached. In this species the terminal flower blooms first, and then the laterals—five to six or more in number—open in the ascending order. The bracts and bracteoles as well retain their foliar character. Tertiary flower-buds are produced to a small extent. The plant is a trailer. Accentuate this habit and the terminal flower would most likely cease to bloom first, then tend to be arrested in its development, and finally never appear. The flowers would now arise acropetally in the axils of the foliage leaves and become in systematic terminology solitary and axillary, provided the tertiary flowers were totally suppressed.

This, however, is a digression, as the origin of solitary axillary flowers according to this fashion is fully dealt with in a succeeding section of this paper.

The genus *Campanula* exhibits a further advancement than that shown in the production of loose inflorescences, largely racemose in character. The flowers, for instance, are clustered to form a dense spike in *C. thyrsoides* and a head in *C. glomerata*. In two other genera of the Campanulaceæ, *Phyteuma* and *Jasione*, compact spikes and heads become the rule.

It is interesting to note that in the Lobeliaceæ (now considered a subfamily of the Campanulaceæ), the more advanced floral structure is associated with a more definite racemose inflorescence, the terminal flower being absent and tertiary flowers rare; whereas in the Campanulaceæ in the stricter sense, the terminal flower is often present and tertiary flowering axes common.

In the large and widely spread family, the Compositæ, which terminates, as it were, a sub-group of the Sympetalæ, commenced by the Campanulaceæ, the head or capitulum has become the uniform style of inflorescence throughout. Further evolution has shown itself, both in differentiating between the flowers (florets) composing this compact form of cluster, and in grouping the heads together to form compound inflorescences.

In the majority of the Compositæ, in fact, the individual head has largely come to function as a single flower, and in many of the radiate forms the likeness to such is very marked, especially so when the ray and tubular florets are few in number and the former wide and petal-like.

It is interesting to note that the clustering together of the heads in the Compositæ advances in a similar fashion to that which has been shown for individual flowers. Solitary heads give place to simple cymose clusters, then follow groupings more or less racemose in character, culminating in compound

heads, found in the genera *Echinops*, *Lagascea*, and *Cæsulia*, in which the individual capitulum is reduced to a single floret.

We have passed in review several families and individual genera possessing inflorescences midway, as it were, between the true cymose and racemose types. Points strongly suggesting the origin of the latter from the former have been brought out and emphasized.

The reverse way of regarding the relationship between these two main types of flower-arrangement seems to the author unsupported by the facts gleaned from comparative morphology.

It appears unnecessary to proceed to any great length with the study of the inflorescence, once it has assumed the racemose form. By the suppression of the internodes, either of the lateral or main axes or of both, the different varieties of racemose inflorescences (spike, umbel, head, etc.) can be derived from the raceme; and I see no reason to depart from this generally accepted view, except in so far as the internodal suppression may occur at times before the inflorescence has completely lost its cymose character. This, perhaps, may be found to occur chiefly in spicate types of clustering. A spicate cyme or pleiochasium may evolve into a true racemose spike, thus eliminating the raceme condition. Consequently, all spikes may not necessarily have been preceded first by true racemes.

One further remark. As racemose inflorescences arise from cymose ones of the pleiochasial type through the arresting of the upper part of the inflorescence, it would seem, as has already been pointed out, that a further development is shown in the reduction of this part to a mere filament or blunt protuberance; and, finally, to a loss of all trace of the former occurrence, resulting in the production of a fixed number of flowers to the inflorescence, or at any rate a marked tendency that way. The inflorescence, in fact, becomes very definite, and shows the unsuitableness of the old terms, definite and indefinite, as applied to cymose and racemose inflorescences respectively.

VI. Continuous Dichasia, Monochasia, and Sympodial Cymose Inflorescences.

In the preceding two sections of this paper one line of evolution of flower-clusters from the simple dichasium, which arises from the solitary terminal flower, has been traced: namely, that advance brought about through the increase in the number of lateral (secondary) floral shoots, whereby the dichasium becomes a pleiochasium. From the latter, by a further increase in the number of laterals, racemose inflorescences have been shown to evolve.

There is another mode of advancement from the simple dichasium which now claims our attention. It has already been pointed out that tertiary

branching to some extent is common in early forms of pleiochasia, and that one of the steps taken towards racemose inflorescences is shown by the suppression of these tertiary floral shoots. In fact, once the axis bearing the solitary terminal flower commences to branch producing a dichasium, there appear to be two further main tendencies, viz. (1) a tendency to augment the number of secondary shoots beyond two, and (2) a tendency to continue the floral branching beyond the first stage. These two tendencies may be considered in a general way as opposed to each other. We have already followed out the evolution of inflorescences due to the first. We have now to trace the evolution of inflorescences arising from the second.

Compound or Continuous Dichasia.—Inflorescences due to the repeated branching of the originally simple dichasium are of common occurrence. It has already been pointed out that in the primitive cyme (the dichasium), flower-buds are often produced in the axils of the paired leaf-structures (bracteoles) on the secondary floral axes. If these elongate and expand, tertiary axes and flowers are produced respectively, and the paired bracteoles on these again may give rise to floral shoots of a still higher order. This floral branching may be continued even further. In this way arise the lax forking inflorescences (compound or continuous dichasia they may be called) characteristic of species of *Ranunculus, Potentilla,* etc., and specially prominent and well-developed in the family Caryophyllaceæ. In *Ranunculus acris* and *R. aconitifolius,* flowers to the fifth degree may be produced. In some of the Caryophyllaceæ the floral branching may be carried still further, as, for example, in *Gypsophila.*

Modifications of these lax repeated dichasia may be brought about through internodal compression or the abortion of certain of the flowers.

Internodal shortening is to be observed in some of the Sileneæ (subfamily of the Caryophyllaceæ), resulting in compound cymose inflorescences, resembling corymbs or umbels. *Dianthus barbatus* (the Sweet William) is a good example.

The suppression of the original terminal flower of these continuous dichasia is not uncommon. The first forking of the inflorescence then appears to be dichotomous, but is in reality only falsely so.

Monochasia and Sympodial Cymes.—So far nothing has been said regarding the monochasium; that is to say, of a cluster consisting of the terminal flower and a single lateral, arising from the axil of a leaf-structure below. From a comparative study of flower-clustering among Dicotyledons, there seems no evidence for assuming that the monochasium precedes the dichasium in the evolution of inflorescences. When a solitary terminal flower gives place, as it were, to a cluster, then not one but two (occasionally three) lateral floral shoots are pushed out. Twin flowered clusters do occur in Dicotyledons, *e. g.,* in the genus *Geranium,* but there is little doubt that these have come from umbel-like compound cymes through reduction.

Possibly the simple (primitive) monochasium might be found to occur in the Monocotyledons, as in this group of flowering plants the individual flower is accompanied usually by a single bracteole, in distinction from the paired bracteoles of the Dicotyledons. However, this does not come within the scope of this paper, which is concerned with the Dicotyledonous inflorescence only.

If, then, the simple monochasium does not occur, how has the monochasial branching arisen in the Dicotyledons? Evidently by a process of reduction. If any continuous dichasium be examined, it will be found that one side almost invariably develops earlier and the branching is carried further than in the other. This is seen even in the Caryophyllaceæ with opposite leaves. In alternately arranged leaves, it is obvious that of two adjacent leaves the lower will be the first developed, and this may account for the earlier production of its axillary floral shoot. At any rate, in a simple dichasium arising from alternate leaves, it is the lower of the two lateral flowers which blooms first; and in such a dichasium when compound, it is the part of the inflorescence which arises from the axil of the lower leaf, that develops earlier and branches to a higher degree.

Opposite leaves in many cases have in all probability originated from alternate ones through the suppression of an internode *; consequently, one of any pair of leaves will be morphologically the lower, and thus if not actually, then phylogenetically, the first of the two to develop. This will account for opposite-leaved continuous dichasia behaving in their development like alternate leaved ones.

By pushing to its farthest limits the unequal development of the two main parts of these forking inflorescences, it is easy to see that a continuous monochasium, in place of a dichasium, would arise. This is apparently how the compound monochasium has originated. A striking intermediate stage has come to the writer's notice in the inflorescence of a species of *Silene* (*S. pendula*). In its earlier branchings it is dichasial, and in its later monochasial only (fig. 6). Further, the barren bracteole of each pair occurring on the monochasial parts of the inflorescence is usually considerably smaller than its associate, which bears in its axil the floral shoot. There is thus a tendency for the sterile bracteoles to abort. Also, owing to the successive flowers assuming a drooping or lateral position, a false axis (sympodium) becomes fairly marked.

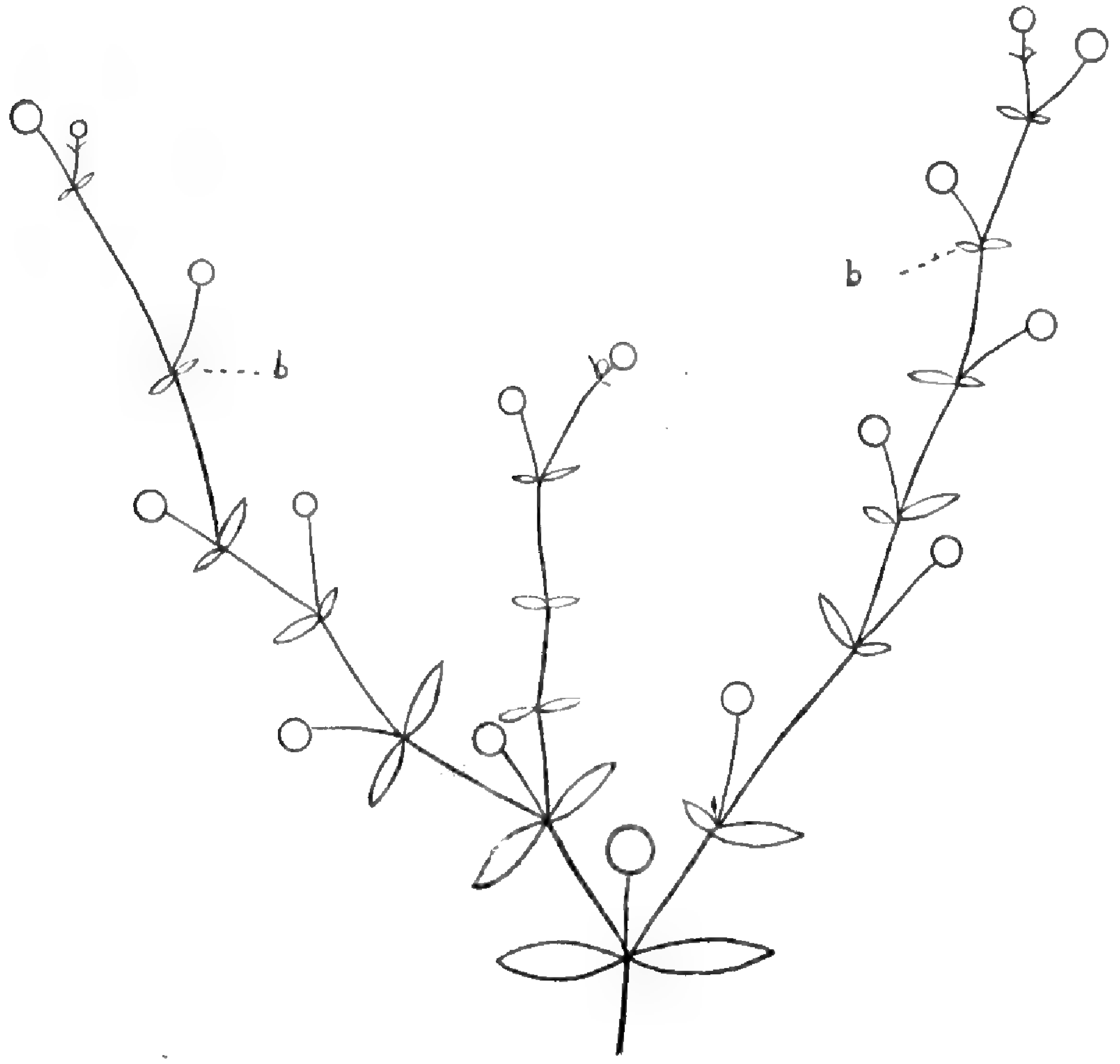
Such an inflorescence strongly suggests that of many Boraginaceæ. Eliminate totally the barren bracteoles, likewise the original terminal flower, and accentuate the sympodium, then an inflorescence such as occurs in many of the Borage family would result. Further, by pushing the one-sided

* Groom, P., "Longitudinal Symmetry in Phanerogamia," Phil. Trans. Roy. Soc. London, vol. 200, B, p. 57, 1909.

development to the full extent, the unforked continuous monochasium would appear—also present in this and other families.

It is, therefore, very probable that the so-called scorpioid cymes of the Boraginaceæ and Solanaceæ have arisen in this fashion, with still further modifications in some cases due to concrescences and the suppression of all bract-structures.

Fig. 6.



Inflorescence of *Silene pendula*, a compound dichasium with strong tendency to one-sided (monochasial) development. Note foreshadowing of sympodial axes and reduced size of barren bracteoles *b*.

VII. The Origin of Solitary Axillary Flowers.

In the terminology used by systematists, flowers when borne singly, and not in clusters, are denoted either as terminal or axillary with respect to their position on the main axis. The flower is considered terminal when it ends the shoot, and axillary when it arises in the axil of a foliage leaf borne on this shoot. The terminal flower has already been studied at some length, and reasons given for regarding it as the starting point of all inflorescences. No attempt appears to have been made to trace any connection between the

two types of solitary flower, either in the direction of deriving the one from the other, or in deciding which mode of arrangement is the more primitive. The two have been kept apart in descriptive morphology, even more so than have the two main types of inflorescence, the cymose and racemose.

The solitary axillary flower was a puzzle to the writer for some time after the connection between cymose and racemose inflorescences became clear. On general grounds it would appear hardly likely that there is no evolutionary connection between the two, and if the one has come from the other, then the derivation of the axillary from the terminal flower would seem more likely than the other alternative.

From a fairly extensive comparison of species bearing solitary axillary flowers with those related forms having their flowers arranged otherwise, three different kinds of solitary axillary flowers have been made out, all capable of derivation either directly or indirectly from the solitary terminal flower.

(1) *Type of solitary axillary flower occurring in arborescent plants, capable of being directly derived from the solitary terminal flower.*

Examples of this type occur in the genera *Michelia* and *Illicium*, belonging to the Magnoliaceæ, a family already pointed out as containing for the most part primitive solitary terminal flowers. To find axillary flowers in such a family seems strange at first, but a comparative study shows how these seemingly opposed modes of flower-bearing are closely connected.

In Angiosperms it may be held that, primitively, the main (plumular) axis produced first a succession of foliage leaves, and after sufficient energy had been stored, these gave place to reproductive leaves (sporophylls), that is to say, to a terminal solitary flower. Examples have already been given of species with plumular axes ending each in a flower. Owing to the production of a flower, the vegetative growth in length of the main axis is brought to a close, and new foliage is obtained by the pushing out of lateral shoots. These likewise, after growing vegetatively for some time, may end each in a flower. In a primitive form we may consider these secondary shoots blooming after the primary.

In trees it might be a disadvantage to cut short the vegetative growth of the main axis by flower-production, and at the same time it might be desirable not to delay seed-formation. Hence the lateral (lower) shoots might commence flowering earlier than the main (upper) shoots. There does seem such a tendency in many trees and shrubs to transfer, as it were, flower-bearing from the main (upper) shoots to the secondary (lower) ones, e. g., *Magnolia grandiflora*, *Calycanthus*, *Rosa* spp. The tree or shrub can thus continue its upward vegetative growth without at the same time deferring its flowering.

Having once transferred the flower-production to the subordinate shoots, it is a short step for the tree to differentiate shoots set apart for flowering from those bearing foliage only. Flower-bearing, that is to say reproductive, shoots tend to be short, with few foliage leaves, in contrast to the purely vegetative shoots, which are often long and many-leaved. This is shown, for example, in the fruit-spurs of apple-trees, etc.

Eliminate the foliage completely from such a shoot or spur, and a solitary axillary flower is obtained, provided that the flower was originally singly borne, and that the foliage, from the axil of which the flower-shoot springs, persists.

This is the explanation advanced for the evolution of solitary axillary flowers from solitary terminal ones in some of the Magnoliaceæ.

Michelia fuscata.—The small flowers of this species are borne singly in the axils of the foliage leaves. The flower-stalk is quite short, and bears midway a marked scar. In the young stage the flower-bud appears to be encased by two bracts, one at the base of the flower-stalk and the other half-way up, corresponding to the scar. Hence this naked flower-shoot shows signs of having once possessed foliar members, and so been a leafy shoot. This flower, then, cannot be considered as primitively axillary, but is rather to be regarded as having been derived from a solitary terminal flower.

Michelia Champaca.—The solitary axillary flower has a short stalk, showing two nodes. Occasionally an indication of a foliage leaf can be found on this stalk.

If such a flower, as the foregoing, be not developed till after the subtending leaf has fallen, then the flower will appear on a naked stem just above a leaf-scar, and thus cease to be strictly axillary, though in origin it is such.

The flowers of *Asimina triloba* and *Chimonanthus fragrans* appear to belong to this category.

Asimina triloba (Anonaceæ.)—The previous year's shoot of this deciduous shrub produces solitary flowers from the lower, and leafy vegetative shoots from the upper nodes. The flower-stalk bears no bracteoles, but has an articulation which points to the former possession of a leaf-structure. There is little doubt, then, that this floral shoot once possessed leaves, and has evolved from a leafy shoot ending in a solitary terminal flower.

Chimonanthus fragrans.—The flowers are produced singly from the nodes of the previous year's shoot. Each is sessile, with numerous brown membranous scales. This shrub has doubtless sprung from a form resembling the existing species of *Calycanthus,* in which the flowers are borne terminally to leafy shoots. These latter can be quite short, with only a pair of foliage leaves.

Kerria japonica may occasionally show flowers borne like those of *Chimonanthus*, with the foliage leaves reduced to scales. In this plant, then, all gradations from the solitary flower terminal to a long many-leaved shoot, to solitary axillary ones can be found.

(2) *Type of solitary axillary flower commonly, but not exclusively, exhibited by climbing and trailing plants.*

Climbing and trailing plants often produce their flowers singly in the axils of the foliage leaves. As the shoot climbs or creeps, the flower-buds arise successively from the axils of the unfolding leaves. Since few flowers are in bloom on a shoot at one time, since the internodes are long, and since the subtending leaf-organs are foliar in character, there is no resemblance to an inflorescence. The flower appears to be both solitary and axillary.

Such an arrangement of axillary flowers seems capable of being derived indirectly from the solitary terminal flower, the feebly differentiated di-, tri-, or pleiochasium being the intermediate type of inflorescence, which was possessed probably by the non-climbing ancestor. Species of two genera, *Clematis* and *Convolvulus*, are now to be considered, which lend support to this view.

Clematis.—This genus, besides climbers, contains erect shrubby and herbaceous forms. Probably the ancestor of the genus had a shrubby non-climbing habit, and from it have come both climbing and herbaceous forms *. Three species have been studied in the living state. Their flower-arrangements lead from a simple, ill-defined, cymose clustering to a stage very near the solitary axillary flower.

C. integrifolia is a herbaceous non-climbing perennial with simple leaves. The main shoots terminate each in a flower. Secondary lateral leafy shoots are produced from the axils of the upper leaves on the main shoot; these also end each in a flower. The mode of flower-bearing is thus somewhat transitional between the solitary terminal flower and the loose leafy simple cymose cluster.

C. Jackmanni (of hybrid origin).—This fine garden clematis is a climber. The long main primary stems bear numerous pairs of pinnate leaves, and finally each stem ends in a terminal flower, which is the first to bloom. From the axils of the upper pairs of foliage leaves arise secondary shoots. Each of these bears a pair of simple entire foliar bracts, and ends in a flower on a long stalk. Each foliar bract produces a tertiary floral shoot of a like nature. The flowers of the secondary shoots open in the ascending order.

* It must not, however, be too readily assumed that all the self-supporting species are primitive; some *may* have become so through the loss of the climbing habit.

In the diagram (fig. 7, A), which was taken from a fresh shoot of average proportions, seven pairs of secondary flowering shoots are shown, opening acropetally.

The inflorescence, if such a term be allowed for a long, lax, leafy flowering shoot, may be regarded as a many-membered pleiochasium with dichasial partial inflorescences. The adoption of the climbing habit has, as it were, lengthened out the flower-bearing part of the main shoot to what we find, *e. g.*, in *C. integrifolia*. This shoot, however, still ends in a terminal primary flower, which is the first to bloom.

C. Viticella.—This species is a vigorous climber, and the manner in which the flowers are borne is somewhat similar to that exhibited by the preceding member of the genus, only that the number of pairs of lateral (secondary) flowering-shoots produced from a main axis is increased—twelve occurring in the specimen from which the diagram (fig. 7, B) was taken. This increase in the number of laterals would appear to be correlated with the vigour of the climbing habit, and also to be responsible for the fact that the primary flower—the one which terminates the main axis—no longer blooms first. Its expansion is deferred till after the lower laterals (secondary flowers) have bloomed. In fact, its period of flowering synchronizes with that of the middle laterals *. There also appears to be a tendency for the tertiary flowers to be suppressed.

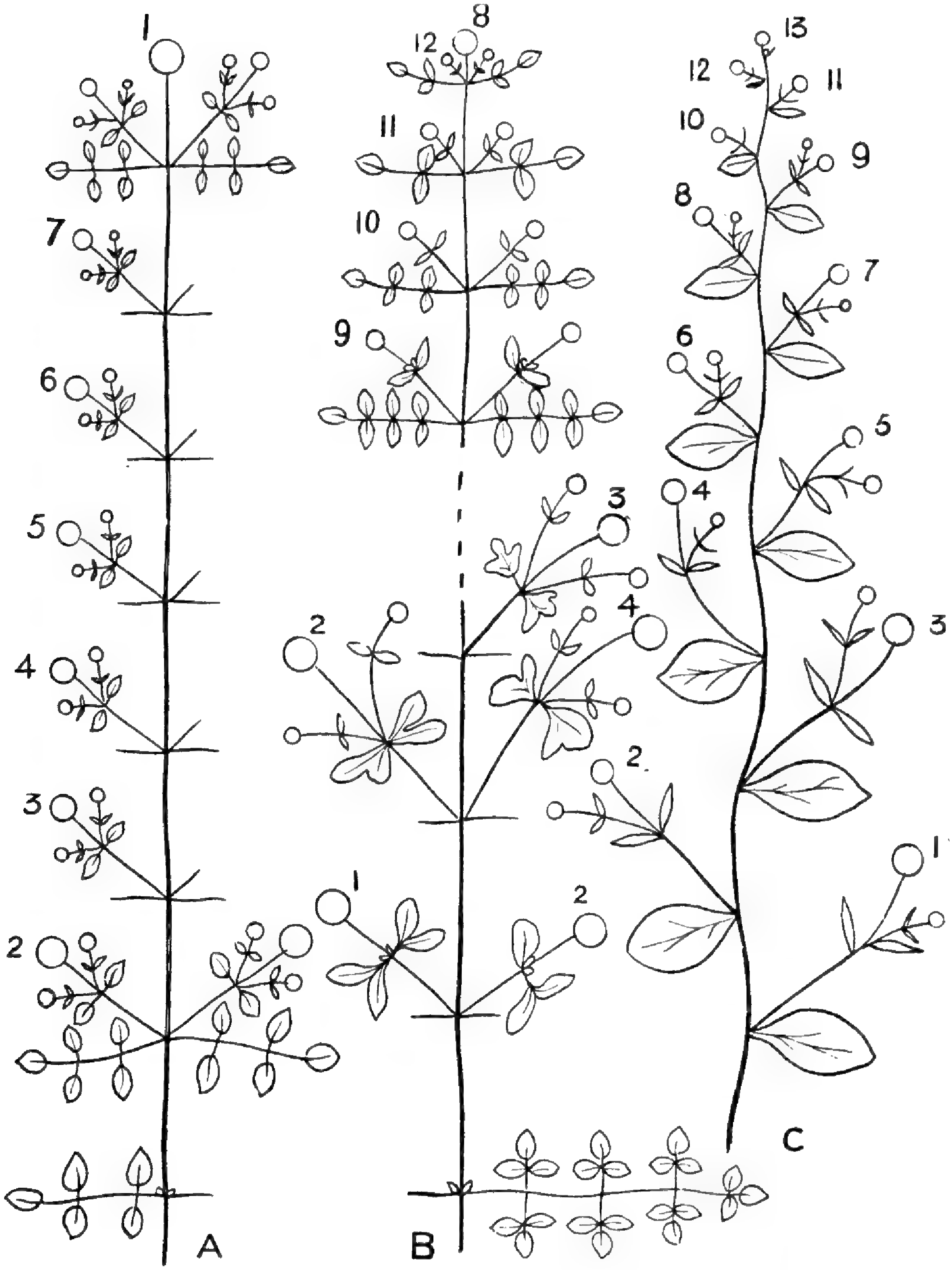
It is, therefore, a short step from such a flower-arrangement as shown by *Clematis Viticella* to one in which, owing to a further increase in the number of laterals, the terminal flower is no longer in point of development in advance of any of the laterals. In fact, an ascending order of expansion is reached, and provided that the main axis continues growing throughout the season, a terminal flower will never be produced. Further, by the complete suppression of the tertiary flowers, by the reduction of the leaf-pairs of the secondary (lateral) shoots to mere bracts, and at the same time by the retention of the foliaceous character of the leaves on the main axis, the flowers will become solitary (or in pairs in the case of opposite leaves) and axillary. The isolation of the individual flowers is rendered still more evident by the long internodes, often a feature of climbing plants.

Convolvulus.—Turning to another group of trailing plants, the Convolvulaceæ, which are noted for solitary axillary flowers, an example (*Convolvulus mauritanicus*) has come to the writer's notice in which an intermediate stage in the evolution of the solitary axillary flower according to the above fashion may be recognised.

The mode of flower-arrangement in *Convolvulus mauritanicus* (fig. 7, C) resembles that in *Clematis Viticella*, only that the leaves are scattered on the stem and not in pairs, as in the latter. The flowers arise on the main axis

* Cf. *Campanula rapunculoides*, p. 542

Fig. 7.



A. Flowering axis of *Clematis Jackmanni*; the foliage and one half of the floral parts ot nodes 3–7 are not included in the diagram. Note terminal flower blooming first.

B. Flowering axis of *Clematis Viticella*; nodes 3–7 are merely represented by the broken line, and the foliage of nodes 1–3 is not depicted. Note that lowest flower blooms first, terminal flower blooming eighth.

C. Flowering axis of *Convolvulus mauritanicus*, lowest flower opening first and terminal flower last.

from the axils of foliage leaves in acropetal succession. The lateral (secondary) flowering shoot bears two bracteoles, and from the axil of one of these a tertiary flower may arise. Thus flowers to this degree may be produced to some extent. The main axis finally ends in a terminal flower, which is the last, or almost the last, to expand.

By an increase in the number of lateral flowering shoots, thus postponing the production of the terminal flower until it never appears, and by the total suppression of tertiary flowers in the above species, a plant with solitary axillary flowers would be obtained. The genus *Convolvulus* contains such, and the foregoing suggests the way in which this flower-arrangement has been evolved. By eliminating the bracteoles as well as the tertiary flowers, the axillary nature of the solitary flower is accentuated. *Calystegia sepium* has solitary axillary flowers, in which the pedicels are naked. The bracteoles may be considered, then, to have vanished in this species.

(3) *Solitary axillary flowers arising from reduced inflorescences.*

This third type of the solitary axillary flower, which has come to the author's notice, can be derived by reduction from the axillary inflorescence.

An axillary inflorescence, further, can be traced back to a terminal inflorescence, in the same manner as the solitary axillary flower of the type A, already considered, can be to the solitary terminal flower. The inflorescences, instead of being developed at the ends of the main upper primary shoots—the primitive fashion—come to arise on the lateral, lower shoots. By the complete suppression of the foliage leaves on these latter, the inflorescence will become axillary.

Another mode of origin for an axillary inflorescence, probably more applicable than the foregoing to the examples mentioned below, is as follows. After a terminal raceme has evolved from a pleiochasium, further complexity can be brought about through the pushing out of lateral racemes from the leaf-axils just below the terminal raceme. If, now, the climbing habit be commenced, these axillary racemes will tend to develop before the apical one ; and eventually, on the new habit becoming firmly established, flowering by means of axillary racemes will become the rule. This manner of evolution of the axillary inflorescence is depicted in Pl. **18.** figs. 6 & 7.

The examples below of this third type of axillary flower are taken from the Papilionaceæ.

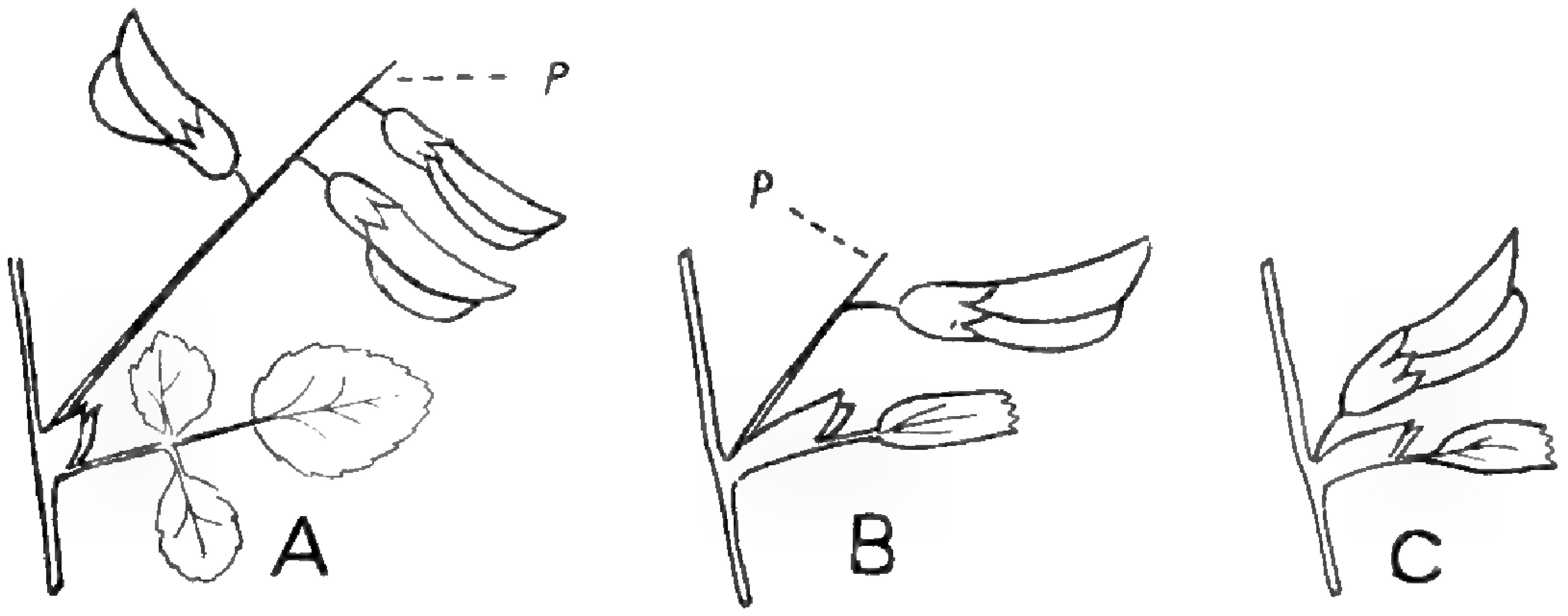
Ononis.—Three species of this genus, which have come to my notice, demonstrate the evolution by means of reduction of the solitary axillary flower from the axillary inflorescence.

Ononis rotundifolia has three-flowered axillary racemes (fig. 8, A). The peduncle, after emitting the successive flowers, ends in a sterile process. No bracts or bracteoles are borne on the inflorescence. The presence of the

process and the absence of bracts suggest an inflorescence which has undergone a considerable reduction in the number of its flowers, and a total suppression of leaf-organs. It is, in fact, a flower-cluster, by no means in the making, but rather one much on the wane.

Ononis Natrix.—In this species the reduction has gone farther (fig. 8, B). Only a single flower is borne in each leaf-axil, and not a cluster, but the manner in which this flower is attached shows unmistakable evidence of having been derived by reduction from an inflorescence like that of the foregoing species. The flower, in fact, is not borne directly on the main axis (peduncle) issuing from the leaf-axil, but on a secondary axis (pedicel) arising laterally from the former. The peduncle is produced beyond the point, where the pedicel is emitted, into a short sterile process. Thus the solitary flower is in reality an axillary raceme reduced to a single bloom, instead of to three as in the previous species.

Fig. 8.



A. Axillary raceme of *Ononis rotundifolia,* consisting of three flowers: *p.,* prolongation of axis beyond uppermost flower.
B. Axillary raceme of *Ononis Natrix,* reduced to a single flower.
C. Solitary axillary flower of *Ononis arvensis,* derived from B through suppression of peduncle.

Ononis arvensis.—The axillary solitary flower possessed by this species appears to be borne directly on a short stalk proceeding from the leaf-axil (fig. 8, C). Without a comparison with the foregoing species, this flower might have been considered as primitively solitary and axillary. The evidence, however, seems strongly in favour of regarding it as an instance of a solitary axillary flower derived from an axillary inflorescence through reduction. The short flower-stalk probably represents the pedicel in *Ononis Natrix*, the peduncle having been completely suppressed.

Axillary racemose inflorescences are of common occurrence in the herbaceous and shrubby Papilionaceæ; hence, whenever single axillary flowers occur, it may be supposed that they have arisen through reduction from axillary inflorescences, even though the steps may not be so apparent as in

the genus *Ononis*. Examples of such solitary axillary flowers have come to the writer's notice in the genera *Vicia* (*V. sativa*), *Cytisus* (*C. scoparius*), *Pisum*, and *Lathyrus*.

The Labiatæ may be mentioned as another family affording examples of such solitary axillary flowers.

VIII. Intercalary and Pseudoterminal Inflorescences.

Finally, consideration is to be given to a type of inflorescence quite different in character from any of the foregoing—in fact, to a form of flower-cluster which has hitherto been largely disregarded by morphologists.

So far, the inflorescences considered in this paper have had either a terminal or an axillary position, but the kind of flower-cluster now to be studied has quite a different arrangement. The flowers are grouped together on an axis which bears foliage leaves, not only below the cluster, but also above. That is to say, the axis, after emitting a cluster of flowers laterally, continues its apical growth vegetatively. Thus the flower-bearing part of the axis is, as it were, intercalated between two foliage-bearing portions. The term *intercalary* is, therefore, proposed for such a type of inflorescence. Some of the Australian Myrtaceæ, *e.g.*, the genera *Callistemon* and *Metrosideros*, furnish good instances of intercalary inflorescences.

If in such an inflorescence the vegatative continuance of the main axis should cease and all traces of it finally disappear, then a falsely terminal flower-cluster would result. The author believes that these exist, and may be by no means uncommon in Dicotyledons. For such inflorescences, derived in this way from the intercalary type, he proposes the name *pseudoterminal*.

Intercalary inflorescences appear capable of being derived from solitary axillary flowers (or it may be, from solitary axillary clusters). When a number of axillary flowers (or axillary inflorescences) become grouped together, and when their subtending foliage-leaves become reduced to bracts, an intercalary inflorescence will be produced.

Descriptions now follow of a few intercalary inflorescences, showing in some instances their conversion into pseudoterminal inflorescences, and in one example their probable origin from the clustering together of separate axillary inflorescences.

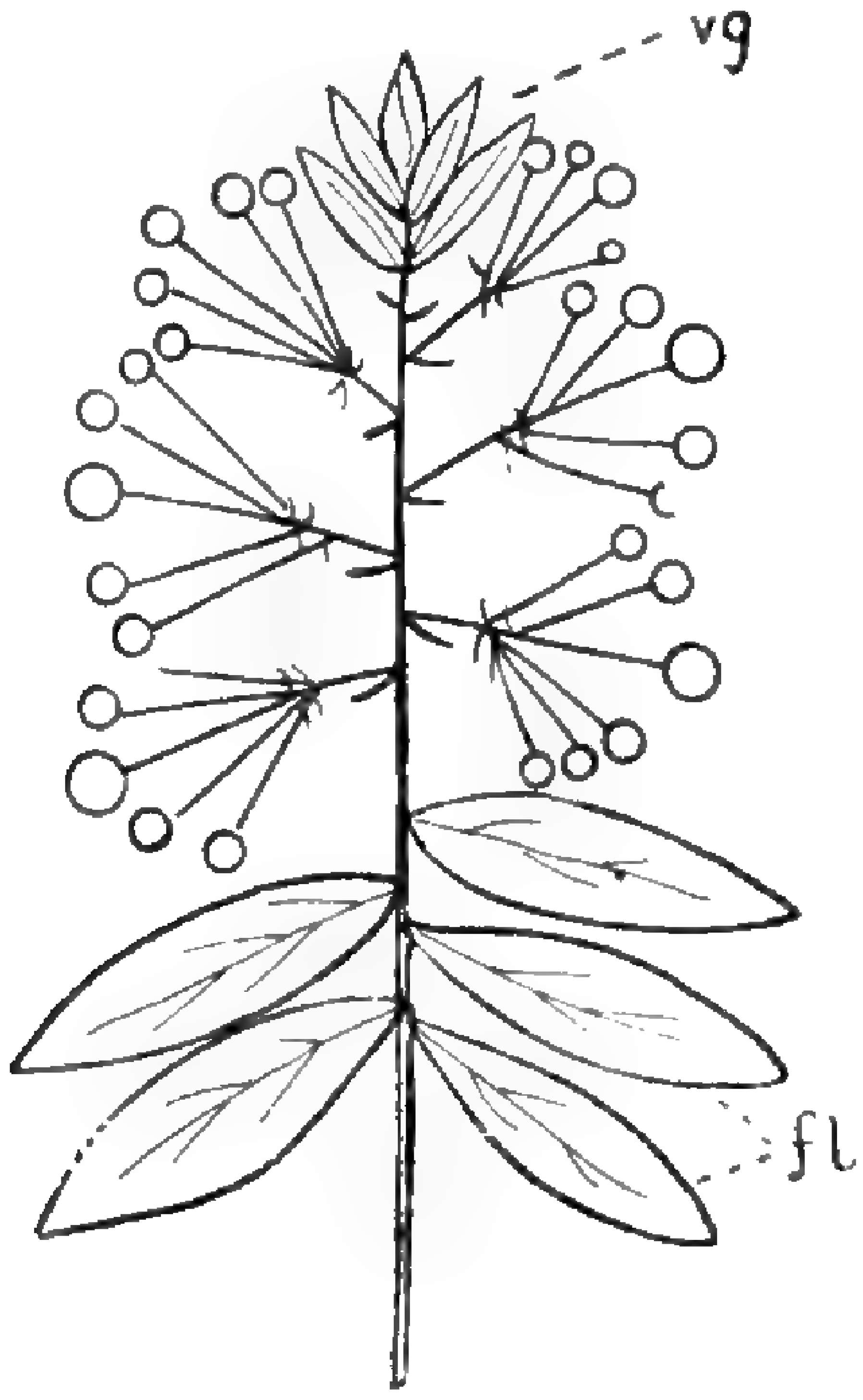
Magnoliaceæ.—This primitive family has been shown already in this paper to contain, not only plants with solitary terminal flowers (*Magnolia* for the most part, *Liriodendron*, etc.), but also ones with solitary axillary flowers (*Michelia*). It further affords examples of intercalary inflorescences. The flower-clusters in the interesting genus *Drimys* are of this nature.

Let us examine a typical inflorescence of *Drimys Winteri* (fig. 9). Superficially it bears some resemblance to a compound umbel, but in reality it is

very differently built up. The main axis, commencing from below upwards, bears first the evergreen leaves produced the previous year, then follow a number of bracts coming off from the main axis close together through the internodes remaining largely undeveloped. In the axil of each bract arises a floral shoot bearing a terminal flower and a false whorl of bracteoles, producing in their axils additional flowers. The main axis, after emitting the flower-bearing shoots, ends in a terminal bud, which gradually unfolds, producing foliage and lateral leafy shoots for the current year.

Occasionally the terminal vegetative bud ending the main axis of the inflorescence becomes arrested; it fails to grow out into a new leafy shoot. A pseudoterminal inflorescence is thus in the process of arising from an intercalary one.

Fig. 9.



Intercalary inflorescence of *Drimys Winteri*. The floral internodes on the main axis are lengthened in the diagram for the sake of clearness. *vg*. vegetative continuation above the inflorescence. *fl*. foliage leaves below.

From an examination of the genus in the Kew Herbarium, *Drimys piperata*, *D. aromatica*, *D. membranea*, *D. dipetala*, and *D. chilensis* appear to have intercalary inflorescences similar to those of *D. Winteri*.

Besides these species with intercalary inflorescences, there are others with apparently terminal inflorescences, e. g., *D. Howeana*, *D. Pancheri*, *D. rivularis*, and *D. crassifolia*. These doubtless are of the pseudoterminal class, the vegetative terminal bud having aborted.

A third mode of flower-bearing occurs in the genus. The flowers are borne in clusters in the axils of the foliage leaves, e. g., *D. axillaris*, and some forms of *D. Winteri*. This, then, most likely represents the primitive way for the genus. By grouping together these axillary inflorescences and

by reducing the subtending foliar organs to bracts, the intercalary inflorescence of the usual *D. Winteri* type would be formed; and, further, by the suppression of the terminal vegetative part an inflorescence, falsely terminal in origin, like that of *D. Howeana* and its associates, would arise.

The axillary inflorescences of *Drimys* would seem to be of dichasial or pleiochasial origin, and have become umbellate in form through internodal compression.

RUTACEÆ.—An example of an intercalary inflorescence, after the style of the one found in *Drimys Winteri*, is afforded by *Choisya ternata*. It is a half-hardy evergreen shrub.

Boronia, another genus of the same family, also provides examples of this kind of inflorescence.

MYRTACEÆ.—This family includes some of the most pronounced instances of intercalary inflorescences, viz., those to be found in the Australian genera, *Callistemon* and *Melaleuca*. The line separating the flower-bearing from the foliar part of the main axis is sharply marked.

ERICACEÆ.—Several examples of intercalary inflorescences are to be found in this family.

The genus *Erica* is of especial interest, as the inflorescence is often of the intercalary type, and in some cases this feature is almost as marked as in the Australian Myrtaceous genera just considered. The British species, *E. cinerea*, has a raceme-like clustering of its flowers, but the main axis of the inflorescence continues to grow vegetatively beyond the flower-bearing part. In the other common British species, *E. Tetralix*, the axis does not continue so, and the clustering of its flowers resembles an umbel. It would, on comparative grounds, appear highly probable that this species has evolved a pseudoterminal inflorescence from an intercalary one.

From a cursory examination of the genus *Erica*, as a whole, it would appear that the intercalary inflorescences have arisen, in the first place, by the grouping together of short lateral leafy shoots, ending in single flowers or in dichasial groups of flowers; and, in the second place, by these shoots becoming shorter and losing their foliar character; thus a cluster of flowers is formed without any intervening foliage—an inflorescence, in fact, of the intercalary order. It is a short step from this to the pseudoterminal inflorescence.

From the study of intercalary inflorescences, it would appear hardly warranted to consider any apparently racemose inflorescence, occupying a terminal position, as truly such, unless by the comparative method it can be clearly shown to have evolved from a panicle with a terminal flower, that is to say, from a cymose grouping.

Racemose-like inflorescences should consequently be investigated from both points of view. In some cases the comparative method may fail to show from which class (intercalary or cymose) the inflorescence has arisen,

owing to the connecting links no longer existing: even then some evidence may be forthcoming from a minute examination of the apex of the inflorescence, a few small leaf-structures in this region without flower-buds in their axils *may* represent the aborted vegetative prolongation.

A raceme, for example, using the term in the strictly descriptive sense, without regard to its origin, may then arise in two different ways, either from a cymose inflorescence with the panicle as intermediary, or from an intercalary inflorescence through the loss of the vegetative continuation.

Taking into consideration the views just expressed as regards the evolution of the intercalary inflorescence, it may have become apparent that this type of flower-cluster must be looked upon as quite different in nature from all other kinds of inflorescences dealt with in this paper and traced back to simple cymose groupings. The former inflorescence is derived by the coming together, through internodal compression and loss of foliage, of a number of single flowers (or of simple cymose groupings of flowers) borne terminally on leafy shoots. While each of the latter is considered to be derived from a single terminal flower through the addition of lateral flowers produced from the leaf-axils immediately below. In fact, instead of all the reproductive material being utilised in the formation of the single terminal flower, it is, as it were, divided among several, new flower-buds being pushed from the leaf-axils below for the purpose.

The first is a flower aggregate arising from the bringing together of originally separate flowers. The second is a cluster due to the production of flowers, in addition to the original solitary terminal one, which previously did not exist.

Upon these views, then, a cymose derived inflorescence is the equivalent only of a single flower, or of a single lateral flower-group, of an intercalary inflorescence.

Summary *.

(1) From a comparative study it seems highly probable that *flowers were originally borne on the plant singly, each terminal to a leafy shoot.* Several genera and species, chiefly in those families which for other reasons may be considered primitive, retain for the most part this early and simple arrangement, e. g., *Magnolia, Liriodendron*; *Calycanthus*; *Pæonia, Trollius, Adonis*; *Papaver, Romneya*; *Kerria*, spp. of *Pyrus, Rubus*, and *Rosa*.

(2) *From such a shoot (or shoots) bearing foliage leaves below and ending in a single terminal flower, all inflorescences, as well as the solitary axillary flower, have probably arisen.*

* The conclusions drawn and opinions expressed in this summary apply especially to the Dicotyledons; at any rate the evidence is derived solely from these.

(3) In the first place, two main classes of flower-clusters appear capable of being distinguished, which may be named the *apical* and *intercalary*. The majority of inflorescences belong to the apical class, which comprises the two types long recognised by botanists, viz., the *cymose* and *racemose*. An intercalary inflorescence is characterised by the fact that the main axis, after emitting a number of flowers laterally, continues its apical growth vegetatively; thus the flower-cluster is inserted on the axis between two sets of foliage leaves.

(4) Reasons are adduced for regarding these two main classes of inflorescences as not being strictly comparable to each other, since their respective evolutions commence differently. An apical inflorescence arises from a single axis bearing a solitary terminal flower. An intercalary inflorescence requires two or more of such axes for its evolution. An apical inflorescence is produced by the pushing out of new flowers alongside the terminal one. An intercalary inflorescence, on the other hand, results when a number of adjacent lateral axes bearing terminal flowers lose their foliage and shorten their internodes. The one is a new production: the other a segregation.

Regarding apical inflorescence :—

(5) *The first flower-cluster to arise from the solitary terminal flower is cymose in character.* This is formed by two or more of the leaf-axils below the terminal flower pushing out lateral floral shoots, each of which usually produces a pair only of leaf-structures (bracteoles), and then ends in a flower. If only two of these shoots be emitted—perhaps the commonest first step in the evolution of inflorescences—*a dichasium* (a group of three flowers) will be formed. If three, then *a trichasium*: and if more, *a pleiochasium*.

(6) From the beginning two main tendencies are observable in flower-clusters arising in this way, viz. (1) the number of secondary (lateral) floral axes tend to increase, (2) the branching tends to be carried further, so that tertiary and higher axes are foreshadowed. These two tendencies are to a large extent opposed to each other.

(7) The first tendency, when followed, leads eventually to the formation of true racemose inflorescences by the following steps :—

(i.) A considerable increase in the number of secondary floral shoots results in the terminal flower no longer blooming first, the flowers generally inclining to an acropetalous order of opening.

(ii.) Next, the uppermost part of the inflorescence is arrested in its growth, and its flower-buds do not expand.

(iii.) This part finally never develops, so that the terminal flower disappears. The inflorescence may now end in a mere filament or a slight protuberance.

By the total suppression of any tertiary branching, and by the complete establishment of the ascending order of expansion, a true raceme results. This line of progression in flower-grouping culminates in the capitulum or head.

Hence it follows that racemose inflorescences have proceeded from cymose ones, the pleiochasium or panicle being the intermediate stage.

(8) The second tendency, when followed, leads primarily to the production of a *compound* or *continuous dichasium*. This can give rise, on the one hand, through internodal compression to *umbellate* and *capitate cymes* : and, on the other hand, through one-sided development to *sympodial cymes*. In continuous dichasia the branching (forking) progresses usually, if not invariably, at a quicker rate on one side than on the other. If this inequality be accentuated until the branching becomes one-sided from the commencement, a *continuous monochasium* results, and, further, by the flowers assuming a lateral position, a *sympodium* comes to be formed. In this way the so-called *scorpioid cymes* of the Boraginaceæ and other families have originated.

Regarding solitary axillary flowers :—

(9) These may arise in at least three different ways, all capable of being traced back to the solitary terminal flower.

(i.) *The solitary axillary flower exhibited by certain arborescent plants.* There is a tendency in many trees and shrubs to transfer the flowers from the upper and principal to the lower and lateral shoots. When such a subordinate shoot, terminated by a single flower, loses its foliage and shortens its axis, it comes into the category of the solitary axillary flower, provided the leaf subtending it persists (*Michelia, Illicium*): if, however the leaf falls previously, then the flower will appear just above the leaf-scar (*Asimina* ; *Chimonanthus*).

(ii.) *The type commonly, but not exclusively, exhibited by climbing and trailing plants, in which single flowers are emitted in acropetal succession from the axils of foliage leaves.* Such an arrangement can be derived from a pleiochasium, in which the leaves on the main axis have remained largely foliaceous (unreduced). As the climbing habit evolves, the flowers will tend to develop acropetally, rather than basipetally, and ultimately the terminal flower will never appear ; for the main axis will continue growing the whole season, throwing off lateral flowers successively from each leaf-axil. Such an evolution for certain solitary axillary flowers has been suggested largely by a study of species of *Clematis* and *Convolvulus*.

(iii.) *The solitary axillary flower which arises through the reduction of an axillary inflorescence to a single flower.* Cases of solitary axillary

flowers originating in this way are to be found in the Papilionaceæ (*Ononis*, *Vicia*). The original raceme in these instances is reduced to the lowest flower, which is not strictly in the axil of the foliage leaf, but appears so, as the main axis of the original inflorescence has been suppressed.

Regarding intercalary inflorescences :—

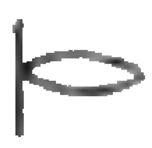
(10) Examples of intercalary inflorescences are furnished by *Drimys*; *Choisya*, *Boronia*; *Calluna*, *Kalmia*; and especially by some of the Australian Myrtaceæ, such as *Callistemon* and *Metrosideros*. This type of inflorescence is capable of giving rise to another kind through the vegetative continuation aborting. An apparently terminal inflorescence will then be formed. In some species of *Drimys* this seems to have happened. Consequently, it is suggested that some apparently terminal inflorescences may, in reality, have originated from intercalary ones. The name *pseudoterminal* is therefore introduced for such. A raceme, for example, using the term in the strictly descriptive sense, can thus arise in two different ways, either from a pleiochasium (panicle) or from an intercalary inflorescence: the flower-cluster formed in the one way will not be precisely homologous with that produced in the other.

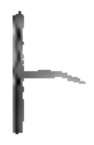
EXPLANATION OF PLATE 18.

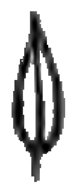
The plate represents in graphic form the main ideas expressed in the paper, regarding the evolution of inflorescences from the solitary terminal flower. Commencing from fig. 1, which represents a shoot bearing a solitary terminal flower, the arrows indicate the lines of evolution. On the left side the evolution of cymose and racemose inflorescences, as well as of two types of the solitary axillary flower, is shown. On the right side the manner in which intercalary and pseudoterminal inflorescences, as well as a third type of the solitary axillary flower, arise, is depicted.

Symbols used :—

=flower.

 =foliage leaf.

 =bract (non-foliaceous leaf).

 =vegetative bud.

=climbing stem.

The numbers 1, 2, 3, etc., show the order in which the individual flowers composing an inflorescence, open.

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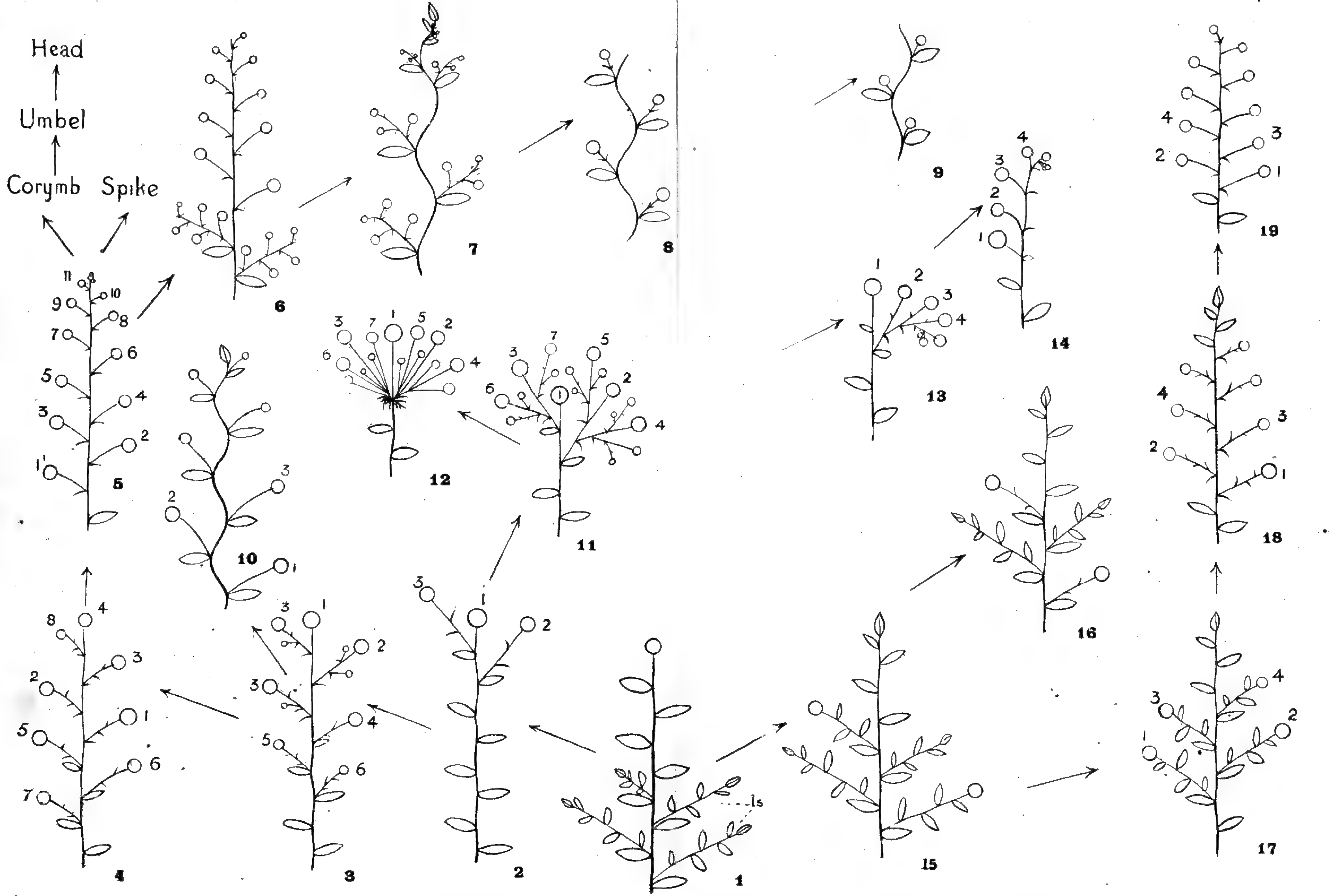

J. P. del.

THE EVOLUTION OF INFLORESCENCES FROM THE SOLITARY TERMINAL FLOWER.

Fig. 1. Solitary flower terminal to a main shoot; *l s.*, lateral vegetative shoots.

Fig. 2. Simple dichasium, consisting of terminal flower and two lateral (secondary) floral shoots pushed out from leaf-axils just below the terminal flower.

Fig. 3. Pleiochasium or panicle with the terminal flower blooming first. Some tertiary floral axes are represented.

Fig. 4. Ditto, but with terminal flower no longer opening first and with tertiary axes wholly suppressed.

Fig. 5. Raceme. Flowers now opening acropetally. Uppermost part of the inflorescence arrested in its growth, so that the terminal flower never develops. From the raceme the other forms of racemose inflorescences can be derived in the usual manner as represented in the plate.

Fig. 6. Axillary racemes produced after the terminal raceme. Racemes end in minute processes, the vestiges of the arrested uppermost parts of the inflorescences.

Fig. 7. Climbing habit assumed. Axillary racemes produced in acropetal succession, the terminal raceme never being reached.

Fig. 8. Axillary racemes each reduced to a single flower.

Fig. 9. Flowers now solitary and axillary.

Fig. 10. Solitary axillary flowers arising in another way from a leafy pleiochasium through the adoption of the climbing habit.

Fig. 11. A continuous or compound dichasium.

Fig. 12. An umbellate cyme derived from the foregoing through internodal compression. Note formation of involucre.

Fig. 13. Continuous monochasium derived from Fig. 11, through one-sided development.

Fig. 14. Sympodial cyme through development of false axis. Note the disappearance of the barren bracteoles present in Fig. 13.

Fig. 15. Solitary terminal flowers borne on the subordinate rather than the principal shoots.

Fig. 16. Solitary axillary flowers arising from the foregoing through loss of foliage and internodal shortening.

Fig. 17. An association of solitary terminal flowers on subordinate leafy shoots.

Fig. 18. An intercalary inflorescence arising from Fig. 17, through the reduction of foliage leaves to bracts and bracteoles.

Fig. 19. A pseudo-terminal inflorescence derived from Fig. 18 through the abortion of the vegetative continuation of the main axis.

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[Synonyms and native names are printed in *italics*. A star * denotes the first publication of a name.]

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